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ABSTRACT

Sixteen international experts comprised the working group charged with indexing technical and cost effectiveness studies related to new educational media. This report, resulting from their meeting in January 1975, contains: (1) introductory report on the problems of the application of cost benefit studies to new teaching methods, (2) series of recommendations for further media cost research, (3) resume of group discussions and reports, (4) list of participants, (5) provisional classification grid of the studies, (6) bibliography of over 200 studies collected, and (7) provisional list of institutions and experts in the field. (STS)

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UNITED NATIONS EDUCATIONAL SCIENTIFIC AND CULTURAL ORGANIZATION

MEETING GROUP ON INFORMATION EXCHANGE ON TECHNICAL AND ECONOMIC STUDIES RELATED TO EDUCATIONAL TECHNOLOGY

(Paris 14-16 January 1975)

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FINAL REPORT

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Unesco - Paris
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INTRODUCTION

In accordance with the programme approved by the 17th session of Unesco's General Conference, the Division of Methods, Materials and Techniques has attempted, in collaboration with the ICEM (International Council for Educational Media) to index those technical/economic and cost-effectiveness studies which concern new methods and means of education in order to set up an inventory and define the methods and principles which would facilitate systematic analysis.

With this in mind, the ICEM invited Unesco National Commissions, public and private organisations in Unesco Member States and private individuals having made such studies to inform them of this by sending a list of work, accompanied by résumés and, if possible, the full text of the study.

At the request of Unesco, the ICEM convened a restricted working group, which met in Paris on 5 April 1974, the objective of which was to make a first classification of the studies received and determine norms for abstracts and propose a first classification grid.

ICEM requested Professor Eicher, the director of the IREDU to prepare a methodological introduction on cost-effectiveness studies applied to the use of new educational methods which would serve as an introductory report at the above mentioned meeting.

The research and identification of studies was a particularly difficult task; few studies are published, others have only a very vague relation to the problems of cost analysis, researchers are isolated and dispersed in many institutions. Despite these difficulties, more than 200 studies were indexed and about a hundred abstracts prepared.

Unesco organised a meeting in Paris on 14, 15 and 16 January 1975 which brought together 16 international experts and observers from various international organisations.

During the three days of the meeting, the group

- firstly, examined the introductory report presented by Professor Eicher, and discussed general problems of the application of cost-benefit studies to modern teaching methods;

- secondly, split into three commissions which each presented a report to the whole group;

- thirdly, adopted a series of recommendations to be addressed to Unesco who would send them to researchers and organisations wishing to undertake similar cost-benefit studies.

The report following this introduction comprises:

1. A slightly modified version of the introductory report.

2. A résumé of the group discussions.

3. The report of each of the 3 commissions.

4. The list of recommendations made in plenary session at the end of the discussions.

5. Annexes - list of participants
   - provisional classification grid of the studies
   - bibliography of studies collected and synthesised
   - bibliography of studies collected and not abstracted.
   - provisional list of institutions and experts working in this field
   - supplementary information sheet.

It must be stressed that the bibliographies and list of institutions are only provisional. It would be of great assistance in the follow up of this meeting if those receiving the report could complete and return the lists as soon as possible.

Unesco foresees the rapid publication of a more complete document as requested by Recommendation No. 3. Information which is received by the Secretariat before 15 July will be included in this publication.

ANNEX:

LIST OF PARTICIPANTS AND OBSERVERS

1. Participants

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CONSTITUTION OF THE COMMISSIONS

Commission I:	Suggestions for the publication of the annotated inventory of the studies
Rapporteur:	Mr. Guillin
Members :	Messr. Dekens; Grabes; Guillin; Lefranc; Martin; Mazza; Mihan and Orivel.
Commission II:	Economic problems
Rapporteur:	Mr. Eicher
Members :	Messr. Debeauvais; Eicher; Hallak; Jamison; Oatey; Schmidbauer; Singh; Mrs. Hommey and Mrs. McDermott
Commission III:	Problems of the Introduction of modern teaching media in the countries of the Third World
Rapporteur:	Mr. Konan Kouadio
Members : :	Messr. Cabrera; Futagami; Konan Kouadio; Shah; Simon Mrs. Chong Lay Leng

COST EFFECTIVENESS STUDIES APPLIED TO THE USE OF NEW EDUCATIONAL MEDIA

METHODOLOGICAL AND CRITICAL INTRODUCTION

The educators' world is often a closed and conservative one. It is marked by a general apprehension of technology, which is readily accused of being "dehumanising".

More lucid minds have, however, very quickly seen what upheavals might be brought about in traditional teaching methods by introducing the revolutionary innovations of recent decades in the field of information media.

Some have even gone as far as to consider that since, in our radically changing societies, the educational system itself must be overhauled from top to bottom, there was cause for satisfaction in the fact the "the need for such changes in education arises at a time when media of communication - radio, television and the film - and new methods and techniques of instruction, such as programmed learning, have come on the scene" (1)

But in fact, innovations in teaching methods have so far almost always remained marginal, and moreover have generally been introduced without such forethought as would have enabled their advantages to be identified and compared with the expenditure involved. Nevertheless, experiments have multiplied, together with attempts at evaluation; some interest is beginning to attach to a stock-taking of the situation, for many methodological problems have now been solved or are about to be so, and many others can at least be defined in more precise fashion.

The many problems which educational systems must face owing to the development of modern techniques of recording and remote transmission of

(1) R. Maheu. Foreword to The New Media: memo to educational planners, UNESCO:IIEP, 1967.

of information are, in fact, all more or less directly linked with the need to compare their cost and their effectiveness. Local and national decision-makers should therefore be helped to view the problems clearly, particularly where local resources are very limited and there is a need to gear the educational apparatus to the urgent requirements of a developing society. Unesco has accordingly taken the initiative of instigating a measure of collective thinking which should lead to the harmonisation of methods of calculation and of approaches to the problem of introducing modern technologies into education.

It is not the purpose of this introductory document to propose a single compulsive method: the author feels quite unqualified to do so and in any event would regard such a proposal as premature. He will not even attempt to draw up an exhaustive table of research already carried out, classified under precise headings; this would probably prove tedious and perhaps not particularly useful. His aim will be more modest but, he trusts, more realistic, namely to identify the areas in which studies already seem to reveal undoubted comparability, those in which method is not yet strict or homogeneous, and those, lastly, where it appears neither possible nor desirable to adopt a pre-established, standardised pattern. Many of the problems involved are obviously common to all cost-effectiveness analyses. We shall attempt, on an analytical basis, to consider successively those problems involved in measurement of cost and those which arise when it is desired to evaluate the effectiveness of an innovation. But before doing so we shall start with an observation that cannot fail to be made after a perusal of the very many studies already carried out, namely the remarkable variety of frameworks of analysis selected; and we shall attempt to determine which types of research should be developed and which appear to be of little use as an aid to decision-making.

I. GENERAL PROBLEMS CONCERNING THE FRAMEWORK OF ANALYSIS

A scrutiny of the studies carried out shows that there are at least four different directions in which the framework of analysis selected is extensive in varying degrees. These apparent inconsistencies can in fact be explained by reference to the objective pursued, which can be established at three different levels.

1. Apparent inconsistencies noted

The characteristic features of the modern means of recording and of remote transmission of information are their reliance on advanced technology and their variety. They can thusbe assessed in several ways:

a) Certain studies elect to examine them from the point of view of one of the partners in the decision bringing about their adoption.

There are three partners: the technician, the economist and the educator. In our view studies which take only the standpoint of one or even two of these partners cannot provide much assistance to the decision-maker and should, therefore, be discouraged.

b) Certain studies consider only one of the technical media and explore the problems of its isolated use from the cost-effectiveness aspect.

Some of these studies are extremely limited in scope: they confine themselves to describing one specific experiment and to measuring its cost and results. Others attempt to pose the problem in more general and abstract terms by establishing, for example, a cost-variation law in accordance with the size of the operation (e.g. defined by the number of pupils involved). But, studies reflecting a greater degree of synthesis all demonstration that no solution based on a single technical process is entirely satisfactory and that we must calculate in terms of a combination of media.

Our conclusion here is therefore, the same as in the preceeding case: estimated-cost studies covering the use of a single technical medium do not lend themselves to generalisation ("optimization"). They should for that reason be discouraged. As for case-studies, these cannot generally be extrapolated and their interest is thus very limited.

c) Certain studies choose to examine the purely marginal use of modern media, whereas others propose the reorganisation or even the total remodelling of the educational system through the use of these techniques.

In the first case the basis is a given structure which is not called into question. All that is asked is whether what is being done (education in its traditional forms) can be done slightly better by using certain "tools" likely to assist the teacher. In the second case, the modern media form the starting point for the construction of a novel educational system.

Studies of each of these two forms of utilisation are obviously not comparable, but neither can be rejected a priori. Studies of the first type have three features which limit their scope:

a) From the point of view of cost: what is proposed is an addition to an existing system. The cost of the new structure is necessarily higher than that of the old.

b) The whole potential of the new instrument - which is introduced only as a minor complement - cannot be exploited. There is a risk, in particular, that costs per pupil will be high, since the considerable economies of scale made possible by the mass use of the media cannot be achieved.

c) From the point of view of efficiency: there is a marginal improvement in the efficiency of a given system, in a way that cannot always be measured, whereas we know that much more substantial improvements would be possible through a change of system.

These studies should, however, be continued, since there must be a constant striving towards improving the quality of the service provided, and since only systematic comparison of the costs relative of the various technical solutions adopted will make it possible to eliminate the wastage observed at present (under-use of costly instruments - or failure to use them at all - because their function has not been thought out in terms of the time situation at the outset, because the teacher has not learned how to use them,

because operating costs have not been evaluated in advance and prove to be prohibitive etc).

Studies of the second type, on the other hand, are much more ambitious but also much more dangerous. They propose, in fact, to replace the existing educational organisation by another.

We do not intend here to pass judgement on these studies, but two comments appear to be called for

First of all, these studies must on no account be systematically discouraged. The profound upheavals to which our societies are being subjected (in the East as in the West, in the industrial nations as in the countries striving to achieve development) are sufficiently obvious for us to conclude that educational systems are themselves sentenced to change. This being the case, it is obviously better for such a transformation to be thought out coherently rather than imposed and anarchical.

In the second place, these studies should not be conducted no matter how and no matter by whom. The educational system performs too important a role in society for its reform to be embarked upon without our having reached a consensus regarding objectives. Here, if only indirectly, we come once more across a danger referred to above, namely that of studies that reflect the preferences of only one of the partners involved. For what must be avoided are reform proposals that are merely a cover for a manufacturer's desir to open up a market, or the utopia of an educator who fails to give due weight to social and political considerations, or again the bleak, narrow analysis o an economist who, in his calculations, confuses the notion of effectiveness with that of profit.

d) Lastly, certain studies start with the educational system considered in its specificity, whereas others simply regard the problem of the optimum use of modern techniques for recording, storing and disseminating information.

The problem here closely resembles the preceding one, without, however, merging with it.

The complex character of the media viewed from a technical standpoint makes it in any case necessary to study the problem of the organisation and optimum association of the technical media in relation to the volume of information and the size and dispersion of the audience for which it is intended. These studies, which regard the educational message merely as one among others, are therefore indispensable at the outset.

We would, however, suggest that attention should be concentrated henceforward on studies which start from the basis of education regarded as a specific system, and this for two reasons:

i) The problem of the optimum use of the media according to the message and the audience is now, in our view, thoroughly mastered.

ii) As stated above, the essential problem (which has not been mastered) is in fact the organisation of an educational system geared to contemporary society and to its state of flux. It is thus logical to take the specific objective

as the starting point in order to arrive at the optimum use of the media, whereas it is often dangerous to consider the media as the point of departure, in the light of which we would attempt to adjust the objectives.

In brief, we can say that among the very many existing studies, only the following are of interest as an aid to decision-making:

1. those that consider the points of view of the three partners at one and the same time - technician, economist, educator;
2. those that consider several competing media simultaneously;
3. those that take the educational system as their point of departure.

For purposes of valid comparison, these studies must be grouped according to the objective in view.

2. The necessary regrouping

We must state here an obvious fact which tends to be overlooked: "optimization" is the adaptation of a paucity of means to the objective being pursued in such a manner as to achieve a given result with the minimum resources (at the lowest possible "cost") or to obtain the most effective result (maximise the "benefit") for a given outlay of means.

Everything depends, obviously on the objective chosen and on the available means.

In the case which concerns us three types of possible objectives can be identified, the first two of which are marginal (although in very different ways) and the third all-embracing and "revolutionary"

Objective No. 1. Marginal improvement of the reception of a given message by the introduction of modern techniques.

The point of departure is the existing system and the proposal is to make the "teacher's" work more effective and to put more life into his relations with the class, while he remains the basic instrument for the transmission of knowledge. This has been, so far, the objective in the majority of the experiments studied.

There can be two parts to this objective:

- in the first, the teacher uses modern methods for all or part of his teaching
- in the second, certain parts of the teaching experience or programme are dealt with using machines.

We have already noted the criticism that can be levelled at such an objective, which necessarily means that only a small proportion of the potential of modern media is used. The studies carried out show us, however, interesting facts. We shall review in the following section the conclusions that can already be drawn with regard to comparisons of costs and efficiency in these marginal experiments.

Objective No. 2. The extension of educational services to groups which the traditional system has not reached.

This objective also leaves the structure of the "traditional" system intact, but it is more ambitious than the preceding one in that it proposes to develop an original educational system for fringe groups.

The groups most frequently catered for by the projects so far studied are :

illiterate adults,

rural adults (so as to induce them to adopt appropriate behaviour patterns for development purposes),

children in remote zones with a thin population,

working adults who have no free time to attend classes in traditional establishments.

The complexity of "optimisation" problems increases here. Comparison is made difficult by the fact that only one fraction (which varies in every case) of the target group is, in fact, involved in each of the experiments studied. Transposition to the educational system as a whole is impossible.

Objective No. 3. Reform of the educational system through the introduction of modern techniques on a mass scale.

We know that the introduction of modern techniques on a massive scale makes it necessary in any event to take a fresh look at educational aims and methods and to reformulate them.

Problems here are much more complex, including, at the technical level, the creation of new networks for the transmission of the "messages".

At the level of the educational system we come up against a considerable constraint: the existence of previous structures (in particular the presence of teachers whose work is governed by a variety of strictly defined regulations); the new objectives must be defined before attempting the "optimisation" process.

Studies of developing trends are indispensable, but there is a risk that they cannot be compared between one country and another because of the sharp impact of the aims selected upon the costs of the different methods.

Case studies, not surprisingly, are still few and far between and give widely differing results. However, an idea of orders of magnitude can be gained.

It is accordingly vital to regroup studies according to the objective in view before making comparisons. When this has been done, comparisons cease to be impossible or absurd; they become merely intricate.

We shall attempt to demonstrate this by considering first of all costs, and then effectiveness.

II. PROBLEMS LINKED WITH COST MEASUREMENT

It seems useful at this point to remind ourselves of the main problems involved in seeking to make an accurate measurement of the cost

of introducing modern educational media. A recapitulation of the observations found in various studies will enable us to suggest certain points of difference and certain methods. This done, it will be useful to sum up the comparative results of the different measurement attempts made so far.

A. Categories of costs and their measurement

Four types of classification of a complementary nature seem necessary if we are to obtain a complete picture and if the categories are to be sufficiently detailed to allow comparisons:

a) a technical classification in which costs are categorised according to the various technical operations that have to be carried out for information (an educational "message") to be received by the person or persons for whom it is intended.

b) an economic classification that distinguishes between fixed and variable costs.

c) an accountancy classification that distinguishes between capital costs and operational expenditure.

d) A financial classification by contributor, whereby direct and indirect costs can be distinguished.

1. Technical classification of costs

To send a message to its recipient by an indirect channel (i.e. other than through the teacher's lips) we must in turn :

decide on the message to be transmitted;

develop the most appropriate technical device for recording this message;

ensure transmission and distribution of the recorded message;

and develop the most appropriate method of reception.

The first operation does not appear to concern us as no technical process is involved. In fact, however, due regard must be had to the available technical media, for which it would be incorrect and illogical to start with techniques and adopt the message to them, it would be equally wrong not to take technical constraints into account. The risk is that these constraints may be such that a large part of any message formulated in the abstract might be lost before reaching its audience.

Three remarks may be made concerning this classification:

i) It raises problems of nomenclature, since certain costs are difficult to classify in one of the four categories, such as formulation of the message, production, transmission or distribution and reception.

For example, in which category should we place expenditure on the duplication of the recorded messages (films, tapes, etc)? We could consider classifying them under production (for as many copies of the recorded message must be produced as will be required), under distribution or under reception.

There is also the cost of rental or installation of cables for closed-circuit television, or the cost of maintaining liaison with the "pupils".

But these are, we believe, more often than not questions of common sense: all that is required is for the person carrying out the study to define and justify his choice.

ii) This classification is very useful, because the relative cost of each stage in the process varies considerably according to the technical medium used. Thus transmission costs are generally higher, in terms of production costs, for television than for radio.

iii) This classification is insufficient in isolation, for it provides no means of establishing whether particular costs fall under expenses of initial establishment or under current expenditure on a system in operation.

2. Economic classification of costs

This classification distinguishes costs according as to whether they are variable or invariable, having regard to the dimension of the operation.

Within each of the technical classification categories, it will thus be possible to distinguish between constant and variable costs. For example, fixed costs at the reception stage include the purchase or rental of equipment (radio or television receivers, film projectors and screens, loudspeakers etc) and certain upkeep costs (salaries of maintenance staff, for example). Variable costs include the purchase of tapes, recording heads, projector lamps, etc., the cost of which in a given period varies with the number of hours of instruction, salaries of those responsible for liaison between equipment and "pupils" (supervisory staff, technicians) and so on.

It will be seen that certain invariable costs are fixed costs, i.e. they are incurred once and for all, or at least at considerable intervals (projection apparatus, for example), whereas others are recurring, i.e. they are repeated from period to period (maintenance staff salaries). This distinction is useful when we wish to study a system in course of establishment, as provision must be made both for the initial financing and the amortization that will enable the capital to be preserved intact. We will revert to this point under budgetary classification.

Before going on, however, four remarks are called for concerning calculation of economic costs:

i) Certain authors include in their costs both the purchase price of equipment and an annual amortization in respect of such equipment. There is a danger here of including items twice, to the extent that the cost of repairs and maintenance, as well as the purchase of new equipment are also reckoned.

ii) Some authors add an interest charge to amortization. From the wider economic standpoint, this is correct, since we are dealing with scarce resources that would have brought in a return if loaned (or invested elsewhere). But since all we are doing is to compare the relative cost and effectiveness of different educational methods this addition is not necessary, and its ommission obviates the need to make a choice - always arbitrary - of interest rate.

iii) The amortisation calculation should be based, in theory, on the obsolescence and technical wear of equipment, but in practice it is sometimes better to opt for a "financial" amortization which takes into account the evolution of sources of finance and of currency resources where certain equipment has to be purchased abroad.

iv) Not only total costs, but unit costs should be calculated. The two categories of unit costs that are the most useful are:

- cost per hour of contact, and
- cost per student.

They can be brought together to form a combined index:

- cost per student-hour.

Some of these unit costs may prove invariable, where the corresponding total cost varies in proportion to the reference variable (number of hours, number of students or number of student-hours).

3. The accountancy or budgetary classification

This classification distinguishes between two categories of expenses: capital (or investment) expenditure corresponding to the financial effort made to constitute assets, and operating expenditure. This distinction can be useful, inasmuch as it allows comparison of the cost of the initiatory stage, and the current operational costs of an established system. The figures needed for this classification are, furthermore, often those most easily available. However, it is neither essential nor really satisfactory, for:

a) It contributes nothing further than the economic classification, in so far as the latter can be obtained in its entirety;

b) It is useless once the initial investment has been made, as only operating expenditures are subsequently involved;

c) It is not normal budgetary practice, in the case of public funds, to include amortization charges in the operating expenditure budget.

4. Financial classification by contributor

This classification distinguishes between costs which are to be met by the organization responsible for capital investment, costs to be met by users, and costs falling to the community.

This distinction can be particularly useful in instances where the proportion to be met by the two last payers is substantial. Its importance is heightened by the fact the evaluations made in the studies reviewed often tend to under-estimate or to overlook these categories completely. Let us take the example of a project involving the part-time use of an existing television channel. The direct cost of the operation - the only one generally reckoned - does not include use of this channel because it appears to be provided free of charge. Nevertheless, the costs of setting up transmitters and relay installations were incurred at the outset with a view to the full-time use of the channel; logic would then require that it is

investment should be charged to the educational system in proportion to the hours used. Failure to reckon this indirect cost is tantamount to self-delusion concerning the real cost of such an operation, since it amounts to believing that there will always be transmitters ready-installed and providing a channel with available hours that can be "appropriated" free of expense.

Similarly, if part of the cost is met by the student (the purchase of a television receiver, for example, in the case of tele-education), failure to include it amounts to shifting, in an insidious fashion, the public authorities' means of gaining an exhaustive and "realistic" picture of costs:

TECHNICAL COST	ECONOMIC COSTS	FINANCIAL COST (by contributor)
Cost of CONCEPTION	Fixed costs	Cost borne by educational authority
	Invariable cost	Cost borne by community
	Variable cost	Cost borne by family
		Cost borne by others
Cost of PRODUCTION	Fixed cost	Cost borne by educational authority
	Invariable cost	Cost borne by community
	Variable cost	Cost borne by family
		Cost borne by others
Cost of TRANSMISSION AND DISTRIBUTION	Fixed cost	Cost borne by educational authority
	Invariable cost	Cost borne by community
	Variable cost	Cost borne by family
		Cost borne by others
Cost of RECEPTION	Fixed cost	Cost borne by educational authority
	Invariable cost	Cost borne by community
	Variable cost	Cost borne by family
		Cost borne by others
TOTAL	TOTAL	TOTAL

These costs can be calculated per student, per hour or per student-hour, according to need. Some of the spaces can obviously remain empty. We can now review what we already know concerning costs and their variations.

B. Results achieved

Results are of two kinds:

We begin first by obtaining a fairly accurate idea of the main cost trends in relation to the magnitude of the system involved.

Next certain differences in the results, if interpreted correctly, indicate thresholds and behaviour patterns of prices.

1. Cost variation laws

Let us first consider total cost, before studying its components.

a) Total cost

The easiest index to interpret is that of cost per student-hour.

The various evaluations bearing on extensions of a single system, or on systems of differing dimensions, lead, it would seem, to the following observations:

i) Evaluation of cost per student-hour in terms of the audience served differs considerably according to the technical medium employed:

- The media giving the greatest economies of scale are: television via satellite, open-circuit television, closed-circuit television and the ration.
- The media whose use gives the least or no economies of scale are: language laboratories, computer-based teaching and films;
- The media for which unit cost increases with the magnitude of the project are: films (once a certain level of population dispersion is reached) and video systems, the cost of which quickly becomes prohibitive because of duplication problems.

ii) The choice of the technical medium obviously depends in part on the geographical area to be covered and on the audience.

Television is thus always too costly when catering for no more than a small number of pupils. But its cost per student-hour drops very quickly up to a figure of one million students; thereafter the rate of drop is much more moderate. The threshold is still very much higher for television via satellite, which can only be considered for the coverage of a vast area.

As a general rule, the "little media" i.e. those requiring relatively simple, inexpensive equipment (slide projectors, epidiascopes, tape-recorders, radio, etc) offer far greater advantages than the "big media" (television computer-based instruction) for small audiences, the relative advantage diminishing subsequently. On the other hand, beyond a certain size of audience, the "little media" lose all their interest, with the exception of radio which keeps a relative advantage whatever the audience size.

b) Specific costs

i) Comparison based on the technical classification:

Production cost is particularly high, whatever the size of the system, for film. It is relatively high for television, but drops very rapidly from an audience-level of approximately 2.000 up to 200.000

It is low in the case of radio and does not drop noticeably with the size of the project.

Transmission and distribution cost:

- very high cost; video system;
- high cost below 200.000 students but dropping rapidly and then rising slightly from 1.000.000 students upwards: open circuit television, close-circuit TV

- Moderate, stable cost: films
- Moderate cost below 100.000 students, very low above: radio.

c) Reception cost

- High cost, dropping only slightly in relation to the size of the system: film, television.
- Moderate cost with a noticeable reduction between 15.000 and 150.000 students: radio.

ii) Comparisons based on the economic classification:

It is now possible to compare, on the one hand, the fixed costs or initial installation expenditure and, on the other the variable or operational costs.

Fixed costs:

These are much higher for television than for radio (of the order of 10:1)

They vary considerably with the geographical coverage and the number of broadcasting hours (ranges of 1:12 for radio, 1:100 for television). Everything depends here on the possibility of using existing installations.

Variable costs:

These drop very quickly with the size of the system (in the case of television they may fall from $5 - $10 to 5 - 15 cents; for radio, from $1 to 1 cent).

They are always much higher for television than for radio

These critieria are extremely valuable in themselves as decision making aids. It is possible in particular, to determine which media it is or is not reasonable to use under certain conditions(1). It should also be stated, however, that the differences in results between one study and another are still considerable.

2. Discrepancies in results and certain possible explanations

Certain variations of evaluation remain to a large extent inexplicable and lend support to the need for precise nomenclature and uniform evaluation methods. The outstanding example relates to the different evaluations of the cost of educational programes televised via satellite in Africa.

However, this is not always the case, and certain discrepancies are, on the contrary, extremely instructive.

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(1) An Agency for International Development study may be consulted on this subject : W. Schramm et al: Big Media, Little Media - A.I.D. Studies in Educational Technology, March 1973, p.104. table 16.

The most frequent case is that of evaluations made at different times. They generally show, for the same medium, a drop in unit costs. This is particularly true in the case of computer-assisted instruction where the unit cost has dropped by three-quarters in about 5 years.

These remarks show that we must be wary of concluding, once and for all, that it is advantageous, or on the contrary too costly, to replace traditional teaching by "modern" methods.

Variations in cost between different contemporary experiments reveal, on analysis, the determining influence of the following factors:

a) the possibility, to a varying extent, of using existing infrastructures;

b) specific features of the area to be covered (physical features, area for a given population, etc);

c) specific features of the population to be reached (homogeneous group or otherwise, in employment or not, etc).

Despite the wide discrepancy in evaluations, we can accordingly say that the results already achieved provide us with a certain degree of knowledge of cost-determining factors; this knowledge can serve as a basis for approximate but reasonable evaluations where all the figured data are not available. As far as effectiveness is concerned the situation is less advanced.

III. PROBLEMS CONNECTED WITH MEASUREMENT OF EFFECTIVENESS

Effectiveness, is infinitely more difficult to assess than cost. It has, in fact, several dimensions, some of which are hardly capable of being measured.

Measurement problems depend to a very large extent on the definition adopted.

In spite of these difficulties, certain lessons can be learned from the evaluations that have already been made.

A. Problems in the choice of a definition

These problems exist at three levels:

i) We must first of all distinguish between educational effectiveness and economic efficiency.

ii) If we elect to measure educational effectiveness, this can be defined in relation to the aims of traditional education or to those assigned to the new system using modern educational media.

iii) We have, lastly, to distinguish between effectiveness in theory and effectiveness in practice.

1. Economic efficiency and educational effectiveness

Economists frequently confuse "profit-earning capacity" with effectiveness. In the case of the educationals system there are two very

cogent reasons for not making shift with a cost-benefit analysis which mixes these two concepts.

First of all, t e viability of the study-process is linked with the additional benefits that educated individuals can command in comparison with those who have not continued their studies. But here we are dealing with the viability of the individual; and recent inquiries have shown that the fact that these differences in gain can be explained in great part by something other than the extra knowledge assimilated, emerges sufficiently clearly to justify us in querying the value of the hypothesis that establishes a strict causality between the level of knowledge and that of benefit. Furthermore, collective profit-earning capacity is not necessarily equal to the sum of the earnings of the educated individuals.

In the second place educational aims are much more varied and ambitious than mere economic viability. It is, then logical to define the effectiveness of the system according to its own aims rather than in relation to objectives which lie outside it. This is in our view the true conception of educational effectiveness.

It must, however, be defined in more specific terms.

2. Effectiveness in relation to the objectives of the traditional system or to new objectives?

If the purpose is to make minor improvements in the traditional system effectiveness must, of course, be evaluated in terms of the objectives of that system.

Two complementary indices are generally used:

a) The time required for the average pupil to attain the level of knowledge considered normal on completion of a given course.

b) The percentage of pupils attaining a given level of knowledge.

It is thus possible to ascertain whether the innovation has been "effective", i.e. whether it has enabled the objectives of the system to be achieved more fully.

But in so far as the introduction of the modern media is on a mass scale, in regard either to groups previously outside the system or to the total school attendance, the old system is disrupted. It would then be incorrect to judge the performance of the new structure on the basis of the objectives of the old, for modern techniques can have the advantage, among others, of aiming at new objectives that are more in keeping with recent educational discoveries and with the demands of contemporary society.

In this case the new objectives are the point of departure for the definition of indices of effectiveness. We might, for example, want to obtain an index of creativity or of individual initiative.

3. Effectiveness in theory and practice

Theoretical effectiveness is that which corresponds to the optimal use of modern techniques.

Two phenomena may, however, keep real effectiveness below this theoretical level:

i) Evaluation of effectiveness is not always carried out at the time of the instrument's technical development, but only when it comes to be applied. This fact, observed in almost all the cases studied, leads us to wonder whether the effectivess then observed is not very much below what it might have been if the optimal combination of technical media had been developed in relation to the aims pursued.

The problem is thus the following: we do indeed measure practical effectiveness, but we do not know whether this effectiveness comes close to the maximum effectiveness of the modern media used to best advantage. We must therefore urge in the strongest terms that evaluation should be carried out at the technical development stage of the media.

ii) Effectiveness assessed by means of a control audience may not be achieved in practice because of a negative attitude on the part of the educational group at hand. For example, television can increase the effedtiveness of the teacher by freeing him from certain mechanical tasks, on condition that he accepts the instrument and does not feel that he has thereby been deprived of some of his prerogatives.

We must, therefore, not delude ourselves as to the effectiveness of these new methods by disregarding these obstacles; we must, on the contrary, try to assess such obstacles before we can combat them.

B. Lessons to be learned from evaluations already made

All serious cost-effectiveness studies include an evaluation of progress in the results achieved by means of the new methods. In spite of difficulties of comparison, due more especially to the lack of homogeneity in definitions, it would appear that the following postulates can be put forward:

1. In the developed countries the pace of the learning process and the percentage of pupils reaching a given level of excellence seem to be roughly the same whatever type of structure is selected.

   In particular, no superiority of the "big media" over the "little media" can de be detected, nor any overall superiority of modern methods over traditional teaching.

   On the other hand a number of pilot projects carried out in the developing countries seem to indicate a greater effectiveness of modern methods, particularly in the case of the least-gifted pupils.

2. There is no indication that certain technical media are generally better than others from the point of view of their effectiveness. It cannot even be proved that a combination of media is always more effective than the use of a single technique, since most of the experiments are, to varying degrees, multi media.

3. It seems, on the other hand, that most media can properly serve as adjuncts to the majority of teaching activities.

4. Lastly, there does not seem to be any significant difference in the effectiveness of a method according to individuals. The most gifted succeed better, in general, whatever is the method.

The conclusion is, then, that modern educational techniques do not seem to reflect any greater effectiveness than traditional methods if effectiveness is defined on the basis of the traditional objectives.

If another definition is taken, this comparison becomes impossible. We can do no more than compare one modern method with another.

This conclusion leads to another: under present circumstances, the choice between different methods has to be made following comparisons of cost alone. There is here an additional reason for stressing the need for homogeneous methods of calculation covering clearly defined, universal categories of cost.

RESUME OF THE DISCUSSIONS OF THE WORKING GROUP ON INFORMATION EXCHANGE ON TECHNICAL AND ECONOMIC ASPECTS OF EDUCATIONAL TECHNOLOGY

Problems of cost were those most frequently discussed. However, the question of effectiveness, as well as its relationship with costs, was also discussed at some length.

I. PROBLEMS OF COST

It was agreed that, in a preliminary phase and for practical reasons, an extensive knowledge of the cost of introduction of modern methods into educational systems must be acquired.

In order to acquire this knowledge, one must

- adopt a universal classification of costs;
- define methods of measurement;
- establish laws for variation of costs.

After discussion, the Commission agreed that a definition of universal categories is necessary if comparisons are to be made.

The classification proposed in the introductory report was thought to be on the whole satisfactory, but the following additions and modifications were proposed:

a) The categories retained must be broken down as far as possible to enable identification of operations and useful comparisons;

b) The technical classification should include a fifth category: implementation costs;

c) The economic classification should clearly distinguish two categories: - fixed costs
variable costs

d) Classification by contributors should include a fourth category: international community

e) In addition to direct costs encountered in the use of modern methods of training, there exist two additional categories which should be recognised in consequence of their importance:

- Opportunity costs: the difficulty in evaluating these was avowed, along with the necessity of separating them completely from expenditures;
- Psychological costs: these are very different from the preceeding because to a certain extent they tend to constitute a limiting constraint on the effectiveness of modern methods rather than a source of budgetary expenditure. In certain cases, however, they could be covered by a financial incentive (for reconversion for example)

2. Cost measurement

Three problems were brought up by the group:

a) Problem of reliability of cost measurement already carried out. Numerous speakers mentioned the danger of non-critical utilisation of this data which has often been developed in a heterogeneous way, using incorrect methods. The frequent presence of three indirect ways of biaising, all tending to underestimate the cost of modern teaching methods, was particularly underlined;

- the greater importance accorded to running expenditure than to capital expenditure when the latter is particularly high and the former somewhat lower in systems using modern educational methods;
- use of official exchange rates when evaluating cost of imported materials;
- personnel cost estimations based on present salaries without taking account of scarcity value related to new requirements in new systems.

b) Problems in defining unit cost. Certain members of the Commission were of the opinion that cost per student was not always the most valuable definition. Use of the notion of cost per hour of teaching using modern methods, leads to very different situations according to the unit applied, production time, transmission time, exposition time. . . It was agreed that some sort of adaptation of the unit cost index to the problem studied should be developed.

c) Problem of discount rate: The rate which is chosen has considerable influence on the level of the cost evaluated. Specificity is therefore fundamental when taken in the light of decision-making. The economist has no precise guidelines to help him make his choice.

3. Evolution of costs

Cost measurement is necessary if one is to arrive at an understanding of cost-effectiveness. Cost studies are made primarily to enable comparisons, in time and in space, and to sort out the laws of cost variation and discern which costs will prove the most advantageous.

At this stage, three points were stressed by the group:

a) Comparison of results of cost studies already carried out rarely leads to establishment of laws because of the very high heterogeneity of situations observed and methods of measurement used.

b) The existance of economies of scale can be important if "big" media are used. This is sollicited, but in no way shown to exist.

On the contrary, certain hypotheses on which these conclusions are based are manifestly false, particularly when speaking of the vast possibilities of substitution between "traditional" teachers and "machines".

c) An attempt must be made to measure the "service capacity" of any given installation .i.e. the number of students above which the capacity of the system is saturated.

The existence of thresholds and disparities in the cost function process was evident to the group, but has not yet been sufficiently studied.

II. PROBLEMS OF EFFECTIVENESS

Effectiveness is much more difficult to measure than cost. Whilst recognising this fact, the group estimated that:

1. Before allowing resources to be used for such studies, a careful examination of this problem is vital, as a knowledge of objectives and their relation to the media used should be acquired.

2. The several conceptions of effectiveness should be distinguished.

   - educational effectiveness should not be confused with economic efficiency. The former should, in principle, be given priority, but everything depends upon the definition it is given.
   - educational effectivness should be extensively defined. The essential is not to find out whether one particular information, transmitted by one particular professor, has a smaller or greater effectiveness if "teaching aids" are used but rather to compare different kinds of messages. The main problem is to discover whether new media are more efficient because they deliver new messages.

3. Efficiency measurement should take account not only of the working time of the professor, but also that of the student. All things being equal, the most efficient system is the one which gives the greatest learning time ceconomies.

4. There should, therefore, be a study in depth of the ways in which students "learn" and what they gain from contact with a variety of media.

5. It is not enough either to base results on previous studies which do not relate to the on-going situation, or to select a given medium arbitrarily. It would be useful to explore systematically the possibilities of using the theory of decision in uncertainty.

III. RELATIONSHIP BETWEEN COST AND EFFECTIVENESS

There was general agreement that these two subjects cannot be studied separately and further discussions brought to light the following two points:

1. In a preliminary phase, there should be an attempt at a systematic comparison of technical and economic costs and combinations of media which have a comparable effectiveness.

2. Studies of the cost-effectiveness relationship should take into account two control variables which have not been used up to present :

- intensity of effort in preparing messages;

- intensity of student effort.

REPORT OF COMMISSION I "Suggestions to Unesco on the publication of an inventory of studies

1. New sources of information

The Commission was agreed on the usefulness of contacting the following institutions likely to respond to requests concerning technical/economic studies carried out in the field of educational technology :

- SWEDEN: A Documentary unit has recently been created at the "Higher Teacher Training Institute" in Malmö (contact: M. Grahn)

- NORWAY: Ministry of Education and Culture.

- USSR: Academy of Educational Science. See the four or five most recent volumes of Sovietskaia Pedagogika. Also Institute for Research into Technical and Professional Training in Leningrad which specialises in the conception and design of packages for technical and professional training. The federal structure of the USSR facilities collection of unpublished data from offices established in each of its principal republics.

- GDR: Contact the "Academie für Pädagogische Wissenschaft" (M. Neurer)

- POLAND: A group, within the Institute of Educational Research, has studied in depth the problem of technical and economic studies and cost calculations.

- The Ford Foundation has financed research into the examination and collation of different studies made for Africa by Africans - abstracts already exist.

Those technical/economic studies or cost/benefit studies in the field of education undertaken by the ILO and not already indexed should be completed.

The IBRD has several studies of this type (contact M. Goreux)

2. Action to ensure comparability of future studies

There are two problems here - one of content, the other of style.

- Terms of reference and the perspective in which the study is to be written should be well-defined (micro-system or macro-system, descriptive studies or propositions)

- The Commission was of the opinion that there should be greater collaboration between the following Organisations:

ILO: UNESCO: ICEM: IBE: IIEP: COUNCIL OF EUROPE:
IBRD: IRFDU: BETEA: OECD(CERI)

so that

1. each organisation contributing to the compilation of the directory of institutions or persons responsible for this type of study should ensure standardisation of information sources.

2. requests for information to local organisations could be combined to avoid double-employment and overlapping of requests.

3. use of personal contacts to create a network of correspondants.

4. to this end, the Commission will circulate a preliminary questionnaire to those members present at the meeting in order to establish a first list of institutions and correspondants.

As to style /

The Commission recommends an attempt at a standardisation of abstracts, not only for methodological presentation and content, but also for identification and research for retrieval of the document. With this in mind, the Commission intends to examine the first type of classification grid which is on the whole satisfactory, after the inclusion of one or two minor modifications (technical/economic parameters instead of technical parameters, economy and management instead of services).

Mr. Martin proposed the ILO and IBE coding by numbers system which has the advantage of being easily adaptable to automatic computer systems. It would also prove advantageous in lowering the costs of using the system.

Future studies

The Commission stressed the urgency of sending out a first list of studies which have already been indexed and abstracted to various local institutions, informing them of the importance attached to this project. The document should also reflect the discussions of the entire working group and could take the following form:

I. An introduction (giving an idea of the way in which the document is planned and requesting suggestions for its improvement)

II. A methodological report (drafted by Professor Eicher)

III. An extensive bibliography of studies retained.

IV. An index of institutions and people competent in the field of research.

V. A selection of representative abstracts:

a) those serving as model abstracts;

b) those giving an example of the coding system to be used in the directory;

c) as an example of studies according to the different media categories and the perspective into which they will be written (macro or micro-systems, descriptive study or proposals)

In conclusion, the Commission suggests the creation of a centralising unit, within an international organisation, which would form the principle link in an information system which remains to be worked out. The Commission hoped that once the educational authorities in the various countries had learned about the existence of such studies, this would lead them to undertake similar studies in the field of educational technology, create technical/economic centres and ensure financial aid to those already existing.

REPORT OF DISCUSSION OF COMMISSION II

Commission II concentrated its attention on the problems of economy.

After discussing the different concepts of cost and effectiveness, the Commission agreed upon the three following propositions:

1. Order of priority in research

Three points should be stressed:

i) at the moment, for practical reasons, it is most useful to concentrate on costs (easier to arrive at an agreement on categories and nomenclatures and therefore easier to obtain comparable data)

ii) However, the two concepts of cost and effectiveness are inseparable. It is essential for a second phase to develop a definition of one or several ideas of effectiveness, sufficiently precise as to permit standardised evaluation.

iii) Much work has already been done on the measurement of educational effectiveness of new teaching media. A small working group (3 or 4 persons) could usefully make a comparative examination of this work and come up with some general conclusions.

2. Presentation of cost studies

All future studies should contain two parts :

a) an outline of the objectives and a precise and detailed description of the milieu, how modernisation will take place and the selected hypotheses. A universal classification, which could have the following headings, should be proposed:

- aims;
- characteristics of the target population (size, age structure, geographical distribution etc)
- organisation foreseen;
- operational schedule.

This classification could be finalised very rapidly by a small working group.

3. Presentation of cost data

It is important to state clearly the difference between technical costs, economic costs and budgetary costs.

i) technical costs :

a) four categories should be distinguished :

- cost for designing the project;
- production costs (development of software is included under this heading and not the preceding one)
- delivery and implementation costs.

b) each heading should be itemised in detail.

c) It would therefore be desirable to recommend a form of stores accounting according to the norms of a general accountacy code.

ii) Economic costs

Several categories should be distinguished:

a) double entry tables should clearly show the distribution between fixed costs and variable costs on the one hand and capital expenditure and running costs on the other

b) there should be at least three ways for measuring unit costs:

- reception time;
- production time;
- the student.

iii) Budgetary costs.

The Commission could come to no agreement on how to separate the consumer category from the budget category.

However, the following recommendations were made:

a) direct costs are most important;

b) costs internal to the organisation should be distinct from external costs.

c) costs borne by the rest of the world should not be ommitted.

REPORT OF COMMISSION III

Commission III undertook to discuss the problems raised by the introduction of modern teaching methods into the Third World countries.

There was a general debate which lead to the proposal of the following recommendations :

1. Similarities and disparities between countries:

The Commission stressed two points:

i) problems raised are of the same type in all countries, whether developed or developing. These problems always raise the same questions - type of cost, category of cost, knowledge of implementing new media, evaluation of results.

ii) However, there do exist differences of degree which are important:

- above all, financial restraints are not of the same scale; less developped countries cannot consider adopting certain technical methods if they are not assured of external finance, not only for capital investment, but also for implementation costs.

- then, the socio-cultural context is often very different from that existing in industrialised countries and hinders the adoption of programmes elaborated elsewhere which are offered as an integrated method (materials + teaching programmes). The Commission considered that this problem merited rapid attention because of the already very great danger of modern teaching methods leading to the disintegration of the traditional culture.

2. Suggestions

These concerned method, priority research subjects and Unesco's role.

i) method:

The Commission thought it preferable to start from a concrete situation and elaborate case studies rather than trying to do more general and theoretical work. It is at the local level that the essential problems are raised: how to develop and improve teaching, taking account of the methods available and the actual situation.

ii) priority research subjects:

a) evaluation of the costs of change in organisation which would permit a reduction of the number of hours the student attends school keeping the same number of students.

b) evaluation of changes in the structure of costs encountered by the introduction of modern methods as a supplement to traditional teaching in a traditional school system.

c) analysis of cost-effectivness of the use of modern methods (recorded courses, correspondance education, night-school, "learning packages") for non-formal education.

d) comparative cost-effectiveness studies on

- traditional education;
- use of local resources to produce low-cost technologies
- use of advanced technologies.

e) Cost-effectiveness study on the different methods which enable the maximum number of pupils to be taught without raising the number of teachers.

f) comparative study of the different adult literacy methods.

5. Unesco's role

The Commission considered that Unesco has an important role to play at three levels:

- information : between different research teams;
  between teams and decision-makers on results of research undertaken;
- promotion of research in this field
- evaluation of studies already made.

LIST OF RECOMMENDATIONS MADE BY THE WORKING GROUP

The working group, being of the opinion

- that modern teaching methods can help solve certain educational problems,
- that cost-effectiveness studies are necessary as an aid to decision,
- that studies made up to now, although numerous, are not much use for several reasons,

wishes to make recommendations in the three fields of:

- information
- cost measurement
- the role of international organisations to improve management of systems using modern methods of teaching.

1. Improvement of information

Recommendation No. 1. The working group asks Unesco to study the problem of permanent information exchange on the cost and effectiveness of modern teaching methods and to play an innovative role in the creation of a world-wide information network.

Recommendation No. 2. The working group recommends a strengthening of cooperation between international organisations in this field and asks Unesco to take the necessary steps.

Recommendation No. 3. The working group asks Unesco to disseminate a document including

i) an extensive list of existing studies, classified in such a way that the problems of cost-effectivness be highlighted

ii) a sample of representative abstracts of the most important types of study.

2. Cost measurement

Bearing in mind that the priority which has been requested for cost stuies is made to ensure short term effectiveness, the Group make the following propositions:

Recommendation No. 4. The group asks that a small working group meet to establish models of standard tables to present different types of cost, thus enabling a precise study of cost variations.

Recommendation No. 5. The group recognises the willingness of Unesco to work on a matrix precising hypothesis, framework, methodology of each study and would like to see a rapid establishment of such a matrix.

Recommendation No. 6. The group insists on the necessity of making effective use of the resources allocated for evaluation in all operational projects where evaluation has been foreseen.

Recommendation No. 7. The group recommends a development of case studies on actual projects in an attempt to discover solutions to specific problems raised by decision makers.

Recommendation No. 8. The group asks Unesco to promote and encourage this type of study.

E. The role of international organisations in the improvement of management of educational systems using modern methods.

Recommendation No. 8. The group desires that international organisations, and especially Unesco, participate, under terms of reference to be defined, in the establishment and development of training courses in methodology o cost studies.

Recommendation No.10 The group would like Unesco to take the necessary action to facilitate management of educational systems using modern methods, for example, by soliciting the publication of a management guide

ANNEX I

LIST OF THE STUDIES REGISTERED UNTIL DECEMBER 1)1973/LISTE DES ETUDES RECENSEES JUSQU'EN DECEMBRE 1)1973

1. LISTE OF STUDIES REGISTERED BUT NOT KEPT/LISTE DES ETUDES RECENSEES ET NON RETENUES

CANADA

ALEXANDER W. E. HOLLAND J. W.
Relating agency objectives to budget organization: factory budgeting for an education film library.
Ontario Institute for Studies in Education, Toronto.

MCLAUGHLIN, H. G.
Educational television on demand - an evaluation of the Ottawa ETV experiment, Ontario Institute for Studies in Education 167 p.

ONTARIO, DEPT OF EDUCATION Toronto School planning and building research Section.
Education and Architecture in the 20th Century - a school design workshop.
March 1969 - 66 p.

SELBY SMITH, C. and SKOLNIK, M.
Concerning the growth of provincial expenditure on education in Ontario, 1938-1966. 36p.
The Ontario Institute for Studies in Education.

FINLANDE

KARIMO, J.
Report of an explanatory study into special questions in the field of instructional technology.
University of Helsinki, Institute of Instructional Television.

FRANCE

D E T E A
Etude critique des diverses solutions étrangères adoptées en matière de cinémathèque et d'archivage en radio et télévision éducatives. Paris, mai 1968, No. 3/1967 43p.

D E T E A
Etude des caractéristiques et des conditions de la projection sur grand écran d'une image télévisée
Paris, avril 1968, No. 10/1967 83p.

B E T E A
Etude comparée du disque souple et du disque dur. Paris, juin 1969 No. 15/1968 - lo p.

B E T E A
Etude des divers matériels de reprographie utilisables par les établissements pédagogiques.
Paris, juin 1971. No. C15/1970, 90 p.

B E T E A
Catalogue indicatif des principaux magnétoscopes actuellement sur le marché
Paris, février, 1972. No. C/16/1970 81 p.

B E T E A
Les laboratoires de langues. Paris, 1971 - No. 4bis/1968 48 p.

B E T E A
Etudes des principaux équipements fixes et mobiles de télévision en circuit fermé destinés à la formation pédagogique des maîtres.
Paris, février 1972 - No. B6/1970 38 pp.

B E T E A
Etude comparative des écrans de projection.
Paris, décembre 1971. No. B11/1970 26 p.

B E T E A.
La télé-distribution, situation actuelle et possibilités.
Paris, septembre 1971. No. 11/1971 19 p.

B E T E A
Elements de choix pour les différents types d'antennes de réception TV ou radio FM
Paris, octobre 1972 - No. 11/1972 . 19 p.

B E T E A
Problèmes techniques relatifs aux circuits fermés de télévision et à ses extensions éventuelles.
Paris, octobre 1972 No. 13/1972. 28 p.

B E T E A
Etude analytique des procédures ou gestion de l'ORTF afin d'en dégager certaines règles pouvant s'appliquer à la gestion de l'OFRATEME(Département des Actions Educatives) compte tenu des différences statutaires entre ces organismes et de la mise en application du plan comptable de l'OFRATEME.
Paris, avril 1972 - No. 18/1972 . 58 p.

B E T E A
Problèmes techniques de compatibilité, de duplication et de transfert entre les différents supports images - Choix du support original.
Paris, octobre 1972. No. 1/1972. 18 p.

B E T E A
Incidences techniques et économiques de l'emploi des pellicules couleur sur les prises de vues cinématographiques.
Paris, mars 1973. No. 3/1972. 68 p.

B E T E A
Note sur les divers systèmes permettant d'obtenir l'effet relief pour les images télévisées, les appareils de projection et de rétroprojection de diapositives ou documents (par projection ou par transparence)
Paris, mars 1973 - No. 10/1972. 26 p.

C N E S (Centre National des Etudes Spatiales)
Différentes possibilités de systèmes régionaux opérationnels pour l'Afrique.
Paris, octobre 1973 . 18 p.

C N E S
Les satellites d'éducation. Colloque international - NICE - 3/7 mai 1971.

ORTF , Direction de l'Action Technique
Comparaison entre video et film. Note No. 4 - 1973 pp. 6. + 5.

GERMANY, FEDERAL REPUBLIC

Anders, W. H.
AV Materialien am DIFF - Technische Ausstattung des Instituts.
In INFO-FIM, Fernstudium im Medienverbund (.1973) 2 S.11-12.

BERGMANN, E.
Schulfernsehen macht jetzt Schule, Westdeutscher Rundfunk geht an den Start. Zahlreiche noch ungelöst.
In: Das Gymnasium in Bayern (1969) 9, S.273-275.

BURKERT, J. und SCHRABBACK, G.
Verlgleichende Übersicht über rechnerunabhängige Lehraustomaten für Einzelschulung.
Wiesbade, Bildungstechnologisches Zentrum GmBH, BTZ-Information. 1 (1972) 2 S.1.

BUSCH, H
System Studienbetrieb im Medienverbund als Instrumentarium gegen den Numerus Clausus.
In: Deutcsche Bildungsmagazin, Das 5(1972)12, S.39-40.

CAPPEL, W.
Fernsehen und Film im Unterricht.
In: Film Bild Ton 20(1970)1. S.5-11

CAPPEL, W.
Möglichkeiten und Grenzen audio-visueller Medien. In/ Sehen und Hören (1970)50 S.59-62.

DRESING, H.
Fernsehen in der Schule
In: Schulmanagement (1971)3, S.65-69.

EDDING, F.
Lassen sich Schulausstattung, Lehr-und Lernmittel rationalisieren?
In: Schulmanagement (1972)1 S.64-68.

FLECHSIG, K-H. u.a.
Probleme der Entscheidung uber Lernziele Begrundung und Umriss des Forschungsplans zum LOT-Projekt.
In: pl. (1970). S-1-32.

FLOSNER, W.
Fachräume Stammraume. Ökonomische und pädagogische Prinzipien im Schulbau.
In: Film Bild Ton, 21(1971)5 S 5-7.

FRANZEN, E. PFLUG, G.
Fachre Audiovisuelle Medien in Hochsulbibliotheken. Pullach bein Munchen: Verlang Dokumentation (1972) 103. p

43

44

HAMMER, A.
Welche Voraussetzungen sind für den Empfang von Schulfernsehsendungen notwendig?
In: Information un Beispiel (1970)1 S.18-21.

HANKE, F. B.
Diapositive als Hilfsmittel im Mathematikunterricht.
Saarbrucken: Pädagogische Prüfungsarbeit des Studienseminars, Saarbrucken (1970) 56s

HEINZE, T.
Wissenschaftspolitische und politokonomische Standortbestimmung der Bildungstechnologie.
In: Beitrage zur Bildungstechnologie, (1972) 2 S.37-46.

HEUN, J.
Arbeitsstreifen in der Unterrichtspraxis. Lehrerurteile über das FWU-Angebot.
In: Film Bild Ton, 18(1968)11, S26-28

HEUSER, I. MESSELKEN H.
Was leistet das Sprachlabor im Englishunterricht an Hauptschulen?
In: Das Sprachlabor und der audiovisuelle Unterricht, (1969)2, S-49-52

HOFMANN, W.
Didacta ad acta. Hannover: Erneute Ernüchterung im AV-Bereich.
In: Medium 2(1972)4, S 10-11.

JETTER, A.
Der Super 8 Film. In Fernseh- und Kinotechnik. 24(1970)6 S191-194

KAPERNICK, H.
Lohnt sich eigentlich ein Sprachlabor In: Schulzeitung Baden-Württemberg, (1971)10.

KREUZIGER, E.
Fernsehen im Unterricht - Fortschritt oder Fehlinvestition.
In: Audiovision 3(1972)2, S 18-20

LENHARDT, H.
Die Zukunft von Rundfunk und Fernsehen in der Auseinandersetzung mit den neueun elektronischen Mediem.
Wein-Munchen-Zurich: Verlag Fritz Molden (1972) 196 S (FWU) 6509

MAUCH, K.
Schulfernsehen in der Bundesrepublik Deutschland. Teil II.
In: dpa Hintergrund, (1972) 3 Juli S 2-11.

MOSER, R.
Die Herstellung von Folien für Tageslichtprojektion.
In: Information und Beispiel (1970)1 S 63-66.

MORKING, R.
Fotografische und elektronische Bildaufzeichnung. (1 Technische Aspekte).
In: Audiovisuelle Hildungsmittel in der Schule von morgen, Munchen: Institut für Film und Bild (1970) 148 S

RADEMACKER, H.
Technische Medien für die Sekundarstufe I. Ausstattungsverschläge und Kosten.
In: Schulmanagement, (1972) 1 S 74-76.

ROWER, K.
Was kann wer fur wen? Leistungsvergleich der audiovisuellen Verfahren beim heutigen Stand.
In: Audiovision (1970)2 S 20-24

SCHMIDBAUER, M.
III. Kommunkationssatelliten in Bildgun und Wissenschaft.
In: Mediensysteme in der Erwachsenenbildung (1971) 234-252.

SCHNEIDER-MEDER, B.
Theorie und Ökonomie der Lehrprogramm-Anpassung und ihre Konsequenzen für die Fragen des Medienverbunds.
Berlin: 10 Symposion über Programmierte Instruktion und Lehrmaschinen in Verbindung mit einer Fachausstellung
(5. 8.4. 1972.)

SCHULBAU UND AUDIO VISUELLE UNTERRICHTSMITTEL
In: Sehen und Hören (1968) 39. S 62, 73-77.

SITTHER, C.
Unterrichtstechnologie kostet Geld.
In: Beyerische Schule (1972) 6/7 S. 134,

STICKELMANN, B. und ZINNECKER, J.
Politokonomische und ministeriai-burokratische Aspekte der Einführung von technischen Mediem in den Ausbildungsektor.
In: Beiträge zur Bildungstechnologie, (1972) 2 S 34-36.

TALBOT, J.
Lösen Satelliten das Problem der kommenden Massenausbildung?
In: Die Schulfamilie, 20 (1971) 12 S 226-230.

WACHSMANN, T.
Medienverbundsysteme.
In: Schul-Management (1970) 2 S 52-54

WEVER, K.
Den Nutzeifekt Steigern.
In: Audiovision 4 (1973) 5 S.15.

WEBER, K.
Videotechnik in der Schule - Trends, Möglichkeiten, Grenzen.
In: Beitrage zur Film-Bild-Ton- Arbeit (1971) S. 6-7.

WEISSENBERGER, H.
Die Entwicklung des 8 mm films.
In: Dokumentation zur IV. Internationalen Agrarfilm-Fachtagung, Berlin (1969) (28-30.1.) S. 66

ZIMMERMANN, D.
Fernsehaufzeichnungsgeräte nach dem VCR-System.
In: Labi-Info (1972)7 S 9-11

ZOCHBAUER, F.
Der audiovisuelle markt der Zukunft. Die Entwicklung der Bild-Tonkassette.
In: Jugend Film Fernsehen 14(1970) 4/5 S. 166-172.

UNITED KINGDOM

BARTELETT, C. C.
Mathematics for Undergraduates by television in Baupai A. C. and Leedham J. F. (eds) - Aspects of Educational Technology Vol 4. London: Pitman, 1970. pp. 428-434

CARTER, C. F.
Can we get British Higher Education Cheaper? Manchester Statistical Society, 15 Dec. 1965, pp 1-14.
Reprinted in Blaug M. (ed) Economics of Education 2. Harmondsworth England: Penguin Books 1969. pp. 326-339

DUNN, W. R. and HARDAN, R. McG. (conveners)
Symposium: Audiovisual self-instruction in medical education. In Packham D. Cleary A. and Hayes T (eds)
Aspects of Educational Technology - Vol 5. London: Pitman 1971 - pp. 90-115.

FLOOD PAGE, C.
Technical aids to teaching in Higher Education
London: Society for Research into Higher Education 1971, pp. 52.

FOY, J. M. and LEACH, G. D. H.
8 mm Film loops as an aid to productivity
in Mann, A. P. and Brunstom, C. K. (eds) Aspects of Educational Technology, Vol, 3. - London:Pitman, 1969 pp. 289-294.

JOHNSON, F.
Film, Television and tape-slide in university teaching.
British Journal of Educational Technology - Vol. 2 No. 3. Oct, 1971 pp. 216-228.

LAYARD R. and WILLIAMS
Meeting the cost restraint
in: Brosan G. et al - Patterns and Policies in Higher Education, Harmondsworth, England
Penguin Books 1971 - pp. 167-179.

MALACH A.
Programmed Learning, Teaching machines and Driver-trainers in Driver education.
IN: Dunn, W. R. and Holroyde, C. - Aspects of Educational Technology, Vol.2. London: Methuen 1969 - pp. 395-402.

SECKHAUSER, S.
A look at the media in Higher Education. Programmed Learning and Educational technology - Vol 9 No. 6.
Nov 1972, pp. 313-333.

TAYLOR, T. R.
Computer assisted instruction in medical education.
Programmed learning and educational technology - Vol. 9. No. 5. Sept. 1972 pp. 272-282

TELEVISION RESEARCH AND TRAINING UNIT, University of London, Goldsmith's College (Gibson, T).
Multi purpose ETV on a budget. London: British Association for Commercial and industrial education, 1968. pp.23

VAIZEY, J.
The political economy of education.
London: Duckworth 1972, pp. 297.

WOODHALL, M. assisted by WARD, V.
Economic Aspects of Education.
Slough, National Foundation for Educational Research in England and Wales. 1972. pp. 127.

WOODHALL, M. and BLAUG, M
Productivity trends in British University Education, 1938/62.
Minerva - Vol 3 No. 4. summer 1965 - pp. 483-498 - "Comments" by Stone R. and Johnson H. and "Reply" by Woodhall and Blaug.
Minerva - Vol 3. No. 5 autumn 1965 pp. 95/105.

WOODHALL, M. and BLAUG, M.
Productivity trends in British Secondary Education, 1950.63.
Sociology of Education, vol. 41 No. 1. - winter 1968 pp 1/35

U S A

ALLEN, W. H. COOMBS, D. H. (ed)
Trends in Educational Technology: the ERIC at Stanford 1970 Planning report.
Stanford University, California, ERIC Clearinghouse on Educational Media and Technology, nov. 1970. 32 p.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION
The Application of technology to Education, 1969. 39.p.

ANN ARBOR Public Schools, Mich.
Implications of instituting a split-trimester calendar plan in the Ann Arbor public schools - A feasibility study report.
June 1970 360 p.

ATKINSON, R. C. (ed) and WILSON H. A. (ed)
Computer assisted instruction: a book of readings.
Stanford University, Calif., Schools of Education 1969. 362 p.

AYFORD, H. W. (ed)
Proceedings of the LARC Computer Based Unit Cost Studies Institute (University of Texas, Austin) - September 1971.
Library Automation Research and Consulting Association, Tempe, Aris. p. 95.

BATTELLE MEMORIAL INSTITUT, Columbus, Ohio
The Role of telecommunications in the regional delivery of educational services: a study of the potential use of instructional television for vocational education in the Appalachian states. Nov. 1972 - 196 p.

BECKWITH, H.
Innovations in industry likely to affect instructional technology during the next ten years.
Academy for Educational Development Inc., Washington D.C. 1970 33 p.

BERNSTEIN, N. N.
Legal restraints on dissemination of instructional materials by educational communications systems.
Memorandum No. 72/5 pp. 33. October 1972 (NASA-CR)

BLASCHKE, C
Performance contracting: who profit most? pastback series No. 4. 1972. 47 p.
Phi Delta Kappa Educational Foundation, Bloomington Inc.

BORUS, M. E. and TASH, W. R.
Measuring the impact of manpower programs: a primer.
Institute of Labor and Industrial Relations, University of Michigan, Wayne State University, Ann Arbor, 1970. 81 p.

BRIGHT R. L.
Should educators generate specifications for the purchase of equipment?
Academy for educational development Inc., Washington D.C. 1970, 15 p.

CARLETON, E.
Administering Instructional Media Programmes.
MacMillan Publishers (New York) 660 p.

CHADWICK, C.
Educational Technology in International Development Education.
Florida State University, Tallahassee, Dept., of Educational Research, Nov. 1970 59 p.

CLARK, R. E.
The best of ERIC ; Recent Reads in computer assisted instruction. April 1973, 15. p.

COHEN, B. J.
Cost-effectiveness information systems.
American Management Association, Inc., New York, 1971 69 p.

COMMITTEE FOR ECONOMIC DEVELOPMENT, New York, Research and Policy Committee.
Innovation in Education: new directions for the American schools. A statement on national policy.
July 1968 86 p.

COMMITTE FOR ECONOMIC DEVELOPMENT
Improving Federal Programme performance: A statement on national policy.
September 1971. 86 p.

COULSON, J. E.
Computer based instruction.
System development Corp., Santa Monica Calif. 12 Fev, 1968 19.p.

CRAMER, A.
Hospital Library Development - Hospital Library Handbooks No. 2.
Intermountain Regional Medical Programme, Salt Lake City, Utah, Jan. 1972. 50 p.

CRASSMAN, D.
The electronic classroom: a guide for planning.
Albany State Education Department. 55 p.

DAVENPORT, R. K. et al.
Engineering systems for education and training proceedings of the Dod - OE - NSIA.
Conference (Arlington, Virigina, June 14/15 1966).
National Security Industrial Association, Washington D.C. 1966.

DAVIS, Lee D. Pricing in a services business. Instructor's manual.
Small business administration, Washington D.C. - 1968 - note 77 p.

DEITCH, Kenneth M. ; McLOONE, Eugene, P. The economics of American education : a bibliography, including selected major references for other nations
Phi, Delta, Kappa, Bloomington, Ind. - 1966 - 69 p.

DENZAU, A. Public Educational finances : 1949/1985 - Memorandum 71/4
November 1971 - 45 p.

DEVITT, Joseph J. Do Federal Programs really work? A study of the effect of one project on public elementary and secondary schools in Maine.
Jan. 1973 - 5p.

DOHERTY, Victor Goals and objectives in PPBS
Portland, Ore. Portland Public Schools, September 1970 - 39 p.

DUDEK, E.E. ; KUEHNER, Karl E. Abstracts of technical reports, July 68/June 69
Naval personal Research activity, San Diego, Calif. Navy Training Research Lab.

DUMOLEN, James R. Instructional television utilization in the United States
Washington University, St. Louis, Mo. Oct. 71 - 49 p.

GEISINGER, Robert W. and others Differentiated staffing
Aug. 72 - 33 p.

EDUCATIONAL FACILITIES LABORATORIES Instructional Hardware/ A guide to Architectural requirements.
New York, Educational Facilities Laboratories - 1970

FEINGOLD, Samuel L. CAI systems past, present and future
System Development Corp. Santa Monica, Calif. Mar. 70, 9 p.

FOLEY, Eugene P. and others Financing ... short and long term needs.
Small business administration, Washington DC - 1965 - 84 p.

FRICK, Frederick C. Educational technology, program, quarterly technical summary
1 June through 31 August 1972 - Massachusetts Inst. of Tech. Lexington - Lincoln Lab.

GREEN, Martin I. The chipley report: a publication of PPBS pilot study procedures and documents in the chipley middle school social studies department.
Florida State Dept. of Education, Tallahasse - Florida State University - 31 Dec. 110 p.

GUNSELMANN, Marshall What are we learning about learning centers?
Oklahoma Christian College - Oklahoma City. 1971 - 213 p.

HAMEL, D.G. Flexible teaching methods for CAI systems
Texas University Austin - Electronics Research Center - 1969 - 10 p.

HIRSCH, Werner Planning education today fortomorrow
California University, Los Angeles - Institute of Government and Public Affairs
Sept. 66

HOCKING, Elton The language laboratory
1960 - 4p

HOPES, Thomas, W. Hope report
Rochester, New York - 1970 - 63 p.

INSTITUTE FOR DEVELOPMENT OF EDUCATIONAL ACTIVITIES, Dayton, Ohio
The computer in education - 1970 - 28 p.

JACOBS, Paul I and others "A guide to evaluating self-instructional programs"
1966 - 84 p.

KIEZEVICH, Stephen J. Ed.; FYE, Glen G. Ed. Instructional technology and the school administrators -
Final report American association of school administration, Washington - 1970 - 143 p.

KROMHOUT, O.M. and others Conference on computers in undergraduate science education :
a computer-assisted and managed course in physical sciences.
Florida State University - Tallahasse - CAI Center - 30 oct. 70 - 21 p.

MARKLE, Susan Meyer Programming and programmed instruction -
Academy for Educational Development, Inc. Washington DC - 70 - 11 p.

MITZEL, Harold E. The potential contribution of computers to instruction reform
Congress of the US, Washington,DC House Committee on Education and Labor
Jan 72 - 5 p.

MORGAN, R.P.; SINGH J.P., and C.A. NIEHAUS Educational Telecommunications in Appalachia -
Phase 1 Report to the Appalachian Regional Commission
May 1972 - 150 p.

MORGAN, R.P. and J.P. SINGH Satellite utilization for educational communications in the United States
AAS Paper No. 73 - 150, 19 th annual Meeting, American Astronautical Society, Dallas,
Texas, June 19/21 - 1973.

MORGAN, R.P.; SINGH, J.P. and B.E. ROBINSON Technology in the future of education
A paper prepared for the Symposium on Improving Productivity of School systems through educational technology
Research for better schools, Inc. Philadelphia, Pennsylvania, Aug. 20.22 1973

MORGAN, R.P.; SINGH, J.P., OHLMAN, H.M. and J.R. DUNOLIN Application of communications satellites to educational development: an overview of the Washington University Program
(cf. France - rapport CNES Nice)

MORGAN, R.P. and J.F. ROSENBAUM Satellites, media and education: an interdisciplinary program relating technology to societal needs.
Proceedings of the IEEE, Special issue on Engineering Education, Vol 59, No. 6, pp. 1001/1003, June 1971

NADLER, Eliezer Inventory systems laboratory - Final report
Johns Hopkins University, Baltimore, Md. Jan. 68 - 136 p.

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS, Inc. Washington D.C.
Computer facilities for mathematics instruction
51 p.

NEWMIN, B.A., SINGH, J.P. and J.F. ROSENBAUM Design of a 12 - GHz multicarrier Earth Terminal for satellite CATV interconnection
Memorandum 71/8 - 64 p. November 1971 - NASA

OAKLEY K., RICHMOND, M. A systematic approach to commercial and clerical training
1970 - 101 p.

CHLMN, H.M. Communications media and educational technology : an overview and assessment with reference to communications satellites
M.S. Thesis, Department of applied mathematics and computer science, Washington University, Report No. MT 71/1, May 1971, 232 p.

PARDEN, Robert J. Ed. An introduction to program planning, budgeting and evaluation for colleges and universities. The proceedings of a Conference.
Santa Clara, Calif. Santa Clara University, Office of Institutional Planning, July 70, 210 p.

PETERSON, Roger E. Television Microwave, 1971
Syracuse, N.Y. Eastern Microwave, Inc., Nove. 1970, 8p.

PIPER, William J. and others Learner centered instruction (LCI): volume 7 - Evaluation of the LCT approach - final report.
Applied Science associates, Inc., Valencia, Pa.

ROBINSON, R. A Delphi forecast of technology in education - M.A. Thesis
Program in technology and human affairs, Washington University
Report No. MT 73/1 - Aug. 1973

SCILA, Karl Introduction to systems cost-effectiveness
New York - Wiley-Interscience - 1969 - 108 p.

SEIDEL, Robert J. ; KOPSTEIN, Felix F. Resource allocations to effect operationally useful CAI
Human resources research organization, Alexandria, Va. - Ap. 70 - 21 p.

SENE, A. and F.J. ROSENBAUM Wideband CW Microwave amplification using gunn effect devises.
Based upon M.S. Thesis by A. SENE, Department of electrical Engineering, Washington University - 94 p. May 1971 - NASA

67

68

SHARMA, G. Still Picture (SPTV) transmission
M.S. Thesis, Department of electrical engineering, Washington University (May 1971 -

SHAW, Jack B. and others C-130 Phase I pilot training program (CCTS)
Air Force tactical airlight center, Pope AFB, N. Car. Apr. 69 - 172 p.

SHUFORD, Emir H. Jr.; MASSENGIL, H. Edward The worth of individualizing instruction
Shuford - Massengil Corp. Lexington, Mass. Nov. 66 - 34 p.

SHUFORD, Emir H. Jr.; MASSENGIL, H. Edward The relative effectiveness of five instructional strategies
Shuford - Massengil Corp. Lexington, Mass. June 67 - 17 p.

SINGH, Jai P. Operating frequencies for educational satellite services
Washington University, St. Louis, Mo - Nov. 71 - 70 p.

SINGH, J.P. and R.P. MORGAN Educational electronic information dissemination and broadcast services history, current infrastructure and public broadcasting requirements
Memorandum III-71/2 - 90 p. - Aug. 1971

SINGH, J.P. and R.P. MORGAN Identification of fixed/broadcast satellite-based educational and health telecommunicationsservices for the Appalachian region - Phase II report to the Appalachian Regional Commission - June 1972 - 135 p.

SINGH, J.P. and R.P. MORGAN Identification of tele-education/medecine experiments for the ATS-F satellite for the Appalachian region - phase III - report to the Appalachian Regional commission, June 1972 - 34 p.

SMALL BUSINESS ADMINISTRATION, Washington DC Merchandise pricing - instructor's manual"
May 1970 - 70 p.

SMITH Robert G. Jr. The design of instructional systems
Georges Washington University - Alexandria, Va - Human resources Research Office - nov. 66

SMITH Robert G. Jr. Teaching machines and programmed instruction - Some factors to consider in implementation. Research memorandum - Army Air Defense - Fort Bliss, Tex. Human Research Institute Aug 61 - 82 p.

SMITH, Wilo Banton Instructional technology and reading : progress, problems and promise
May 1972 - 22 p.

SPAIN Peter L. A report on the system of radioprimaria in the State of San Luis Potosi, Mexico
Stanford University, Institute for Communication Research

STAGL, T.; MORGAN N.H. and J.P. SINGH Computer-aided communication satellite system analysis and optimization - Based upon M.S. Thesis by T. STAGL, Department of Electric engineering, Washington University - Report 73/2 - forthcoming

STAGL, T.W. and J.P. SINGH Computer programs for mapping satellite-born narrow-beam antenna footprints on earth.
Memorandum 72/3 (26 p.) - March 1972 (NASA)

STAGL T.W. and J.P. SINGH Computer programs for plotting spot-beam coverage from an earth-synchronous satellite and earth station antenna elevation angle contours" -
Memorandum 72/4 (37 p.) - October 1972 - NASA

TALLMADGE, G. Kasten; and others Study of training equipment and individual differences. The effects of subject matter variables. Final technical reports.
American institutes for research with behavioral sciences, Palo Alto, Calif. May 1968 - 70 p.

71

72

WILSON, Stanley; BILLINGSLEY, Ray Factor-factor II - Departmental program and model documentation 71-3
Texas A. and M. University - College Station - Jan. 71 - 75 p.
presentation in cooperation with the Stage WUTLEX Program

INTERNATIONAL INSTITUTE FOR EDUCATIONAL PLANNING - UNESCO - Paris

CHAU, Ta Ngoc and others Population Growth and Costs of Education in Developing countries
1972 - 306 p.

O.C.D.E.

"La technologie de l'enseignement" - conception et mise en oeuvre de
systèmes d'apprentissage - CERI

KIESLING, Herbert J. Staffing patterns and costs in alternative educational futures.
Paper prepared for the organization for Economic Cooperation and Development, January 1973 (mimeographed)

"Budgeting, programme analysis and cost-effectiveness in Educational
Planning", Paris, 1968 - 304 p.

UNESCO

SERLA Model Document D - Hardware March 1971

Document Q - SALVATORI G. Comparison of merits of various systems of telecommunication according
to coverage - Part II: study of current annual costs - Aug. 71.

ANNEX I.2

LIST OF STUDIES REGISTERED, SELECTED AND ABSTRACTED/LISTE DES ETUDES RECENSEES RETENUES ET POUR LESQUELLES EXISTE UNE RESUME ANALYTIQUE

It will be noticed that a five digit figure follows each title. This can be comprehended by way of the classification grid hereunder. This grid comprises three colums: column 1 = 1st digit
column 2 = 2nd digit
column 3 = 3 last digits

ex: 41.761 is a study on systems(4) a case study (1) the subject of which bears on television (7) radio (6) and is in the form of documents (1)

On remarquera que chaque titre est suivi par un nombre de 5 chiffres déchiffrables au moyen de la grille de classement ci-après. Cette grille est composée de 3 colonees. A la colonne 1 correpond le 1er chiffre
" 2 " le 2eme chiffre
" 3 correpondent les 3 derniers chiffres.

ex: 41.761 est un travail sur les systèmes (4), une étude de cas (1) portant sur la télévision (7), la radio (6) et se présentant sous la forme de documents (1).

GRILLE DE CLASSIFICATION (5 chiffres)

Type d'étude - (1 chiffre)	Type de situation (1 chiffre)	Media - (3 chiffres)
1. Etudes économiques de caractère général ou méthodologique		0. Non applicables
2. Media isolés	0. non applicable	1. Documents imprimés
3. Media combinés	1. cas existant	2. Moyens non projetés
4. Systèmes	2. cas théorique	3. Projection fixe
5. Gestion et services		4. Film animé
6. Etudes concernant l'efficacité		5. Moyens sonores
		6. radio
		7. télévision
		8. Ordinateur
		9. Autres

CLASSIFICATION GRID (5 digits)

Type of study (1 digit)	Type of situation (1 digit)	Media (3 digits)
1. General or methodological studies		0. Non applicable
2. Isolated media	0. Non applicable	1. Printed media
3. Combined media	1. Existing situation	2. Non projected media
4. Systems		3. Still projection
5. Management and services	2. Hypothetical	4. Motion film
6. Effectiveness studies		5. Sound media
		6. Radio
		7. Television
		8. Computer
		9. Others.

LISTE DES ETUDES RECENSEES, REVUES ET ABSTRACTEES AVEC INDICATION A DROITE DE LA CLASSIFICATION SELON LA GRILLE ETABLIE

CANADA	HEATHER E KNOEPFLI, A Cost analysis study - Arts 100: Communications - Paper Number 16 a - Project Director, The Ontario Educational Communications Authority, 1973.	41.761
FRANCE	B E T E A. Le message audiovisuel - techniques de réception, Paris, mars 1966. pp 25	22670
	B E T E A. Le message audiovisuel - économie comparée des prix de diffusion et des transferts possibles d'un support à un autre, Paris, mars 1966. pp. 30.	22675
	B E T E A. Installations de production radiophonique en faculté - possibilités offertes. Paris mars, 1966 pp. 21	22600
	B E T E A. Etude comparée de la rentabilité économique des différents systèmes d'em loi différé sur bande magnétique des émissions de la radio scolaire. Paris, septembre 1968 - no. 5/1968 44p	22650
	B E T E A. Etude économique des différents types de circuits de télévision intégrés dans les établissements scolaires. Paris, décembre 1969 - No. 1/1969. 53 p	21.700
	B E T E A. Etude des solutions les plus économiques pour la réception de la télévision en fonction du nombre d'élèves (classes et amphithéâtres). Paris, février 1970 - No. 2/1969. 20 pp	20700
	B E T E A. Comparaison entre la diffusion par film et par télévision. Paris, juin 1971, No. 4/1970 - 51 p.	22470

B E T E A. Etude technico-économique d'un service type des moyens d'enseignement. Enseignement Supérieur. Paris, décembre 1971 - No. 5/1970 - 100 pp 52000

B E T E A. Comparison de deux systèmes permettant d'améliorer l'exploitation locale des programmes de télévision de la RTS., l'un par enregistrement local des émissions diffusées par voie hertzienne, l'autre s'appuyant sur la distribution de films Super 8. Paris, décembre 1971 - No. 2/1971 pp. 30 22740

B E T E A. Etude de l'identification, la conservation et la re-distribution des programmes universitaires de radio et de télévision. Paris, août 1972 - No. 3/1971 pp 64 52000

B E T E A. Coûts de production comparés S 8 et video portables, Paris, juin 1973, No. 4/1971 - pp. 26 20740

B E T E A. Mise en place d'un système généralisé de distribution de programmes audiovisuels enregistrés. Paris, novembre 1972 No. 2/1972 pp. 30 22470

BITRAN, J. "Techniques audiovisuelles et économies de l'éducation en Afrique Francophone" Paris, AUDECAM, juin 1973 pp. 182 41670

C N E S. Les expériences de télévision éducatives réalisables avec le satellite Symphonie. Paris, octobre 1974 - pp. 15 42700

C N E S. Socrate Télévision éducative en Afrique. Etude économique comparée entre un système à satellite d'éducation et des chaînes de télévision éducative nationales. Brétigny, septembre 1971 - pp. 140 + annexes 42700

LACHENAUD, J. Le lancement de l'expérience de télédistribution de Cergy-Pontoise. Télé-distribution No. 1. 1973 pp. 22/29 21700

MERCIER, C. Problèmes posés par l'utilisation du film dans l'exploitation de la télévision.

MERCIER, C. Problèmes posés par l'utilisation du film dans l'exploitation de la télévision. Revue de l'UER. Cahier A Techniques, No. 95 - février 1966, pp 2/16 — 20704

MINISTERE DU DEVELOPPEMENT INDUSTRIEL ET SCIENTIFIQUE
L'économie des systèmes d'aide à l'éducation. Délégué à l'Informatique, octobre 1970. pp. 107 + tableaux — 10.000

GERMANY - FEDERAL REPUBLIC

GRIEGER, S and KRAMKENHAGEN, C. Vorschläge für Mediotheks-Modelle. Munchen, Institut für Film und Bild (1972) — 52000

HOFFBAUER, H. Das Quadriga-Funkkolleg "Erziehungswissenschaft" In Mediensysteme in der Erwachsenenbildung, 1971. 72 95. Munchen, Internationales Zentralinistitut für das Jugend- und Bildungsfernsehen. — 41160

SCHNEIDER, Walter and SIGELEN, H. Zur Okonomie des Fernstudiums. Deutsches Institut für Fernstudien an der Universität Tubingen, p. 176 1973

UNITED KINGDOM

AUSTIN, D. PORTNER, C. and SWALLOW, B.
The Leeds Project. In Tobin, H. J. (ed). Problems and Methods in Programmed Learning - Part 3. University of Birmingham, 1967. pp 35-44 — 31900

BARAY, M. S. Programmed Instruction in BEA. Pergamon, London. 1968. p. 46 — 21190

CLARY, D. W. Initial Feasibility Trails into the Cost-Effectiveness Use of CCTV in Army Training in Bajpai A. C. and Leedham J. F. (eds) Aspects of Educational Technology Vol 4. London, Pitman, 1970. pp 158-166 — 21700

CUMMING C. E. Studies in Educational Costs. Edinburgh: Scottish Academic Press - 1971 pp. 247 — 10000

CUMMING, C. E. and DUNN, W. R. The application of cost-effectiveness techniques to Educational Technology. In Bajpai A. C. and Leedham (eds) Aspects of Educational Technology, Vol. 4 , Pitman: London, pp. 300-308 10000

DUNN, W. R. HARDEN, R. HOLROYDE C. LAVER, R. and LINDSAY, Q. Investigations of self-instructional materials in Medical Education. In Mann, A. P. and Brunstrom C. K. (eds) Aspects of Educational Technology, Vol 3. London: Pitman, 1969. pp. 339-346 61993

HALLAK, J. Cost effectiveness. World Conference on Administration and Planning of Audio-Visual Aids, ICEM/UNESCO, London July, 1960 Reported in Visual Education October 1970 pp. 35/38 10000

HAWKRIDGE, D. G. The Open University in the Third World. Educational Broadcasting International. Vol 6 No. 4. Dec. 1973 42750

LAYARD, R. and OATEY, M. The cost-effectiveness of the New Media in Higher Education. British Journal of Educational Technology. Vol. 4. No. 3. October 1973 pp 158-176 10000

OATEY, M. Effectiveness and costs of instructional media. Staines, England: Air transport and Travel Industry Training Board. Research report 72/1 - pp. 58 10000

VAIZEY, J. HEATON, N. and NORRIS K. Costs of the New educational technologies. "Lisbon: Centro de economica e financas" 1971 108 p. 31719

WAGNER, L. The economics of the Open University: Higher Education Vol 1. No. 2. May 1972 pp. 159/183 41000

82

U S A

AMERICAN ASSOCIATION OF SCHOOL ADMINISTRATORS. Committee on Technology and Instruction. "Instructional Technology and the School Administration" 1970 pp. 50/70 22870

83

U S A

AMERICAN DATA PROCESSING INC. Detroit, Mich. Computers in Education: their use and cost, educational automation monograph no. 2. 1970 p. 99 22800

AMERICAN DATA PROCESSING INC. Computers in Education: their use and cost. 1970 p. 97 22800

ANDERSON, B. D. and GREENBERG, Ed.
Educational production functions for teachers. Technology mixes: problems and possibilities. Washington University, St. Louis. Program on application of communication satellites to Educational development. March 1972. 104 p. 10900

BARRETT H. J. DENEAU, A. T. Future development of instructional development. Washington University, St. Louis. Nov. 1971 45 p. 42700

DORICH, Gary D. Guidelines for the integration of instructional television in speech and hearing facilities. Indiana University Bloomington, Speach and Hearing Center. 1969. 33 p. 21700

BROWN, B. R. and O'NEILL, F. Computer terminal selection: some instructional and psychological implications. Florida State university, Tallahassee - Computer Assisted Instruction Centre 15 May 1971 29 p. 21800

BUNDERSON, C. V. Justifying CAI in mainline instruction. Texas University, Austin. CAI Lab. 17 June 1970 29 p. 21800

DEI ROSSI, J. A. et al., A cost analysis of minimum distance TV networking for broadcasting medical information. Rand Corp. Santa Monica, Calif., Feb. 1970. 84 p. 22700

DICK, W. and GALLAGHER, P. Systems concepts and computer managed instruction: an implementation and validation study. Florida State Univ., Tallahassee, CAI centre. 15 April 1971. 27 p. 61800

U S A

HANSEN D. N. et al., Research and implementation of collegiate instruction of physics via computer assisted instruction - Volume I final report. Florida State University, Tallahassee CAI centre 15 November 1968. 150 p. 61800

INSTITUTE FOR COMMUNICATION RESEARCH - Stanford University.
MAYO, J. McANANY, Emile G. and KLEES, S. The Mexican Telesecundaria: a cost effectiveness analysis, March 1973. 41700

INTERNAL REVENUE SERVICE. Washington, National Training Center Television report - number 3, March 1969 39 p. 21700

JAMISON D. LUPPES, P. and WELLS, S. The effectiveness of alternative instructional media: a survey. Institute for Communication Research, Stanford University 60000

JARBOL, D. Television and Educational Reform in El Salvador. Institute for Communication Research, Stanford University, Aug 1973. 322 p. 41700

JOHNSTON, F. C. and DIETRICH, J. E. Cost analysis of instructional technology. Academy for Educational Development Inc., Washington DC 1970 18 p. 21700

LEVIN, H. M. Cost effectiveness evaluation of instructional technology: the problems. Academy for educational development Inc., Washington DC. 1970. 15 p. 10000

MULVIHILL, P. J. Cost effectiveness study of regional instructional materials centres. Pensylvania State Dept., of Education Harrisburg. Bureau of Educational Research, August 1971. 20 p. 51000

PIPER, W. J et al., Learner-centred instruction (LCI) Volume VII, Evaluation of LCT approach. Applied Science Associates, Inc. Valencia. 41090

RHODE, W. E. et al., Analysis and approach to the development of an advanced multimedia instructional system. Vol I. Final report May 1970 436 p. 41909

RO

BOG ES, D. A. A study of the applicability of cost effectiveness techniques to small scale instructional systems Mars 1972. 12 p. 10000

BOK, R. Computer aided instruction for a course in boolean algebra and logic design. Final report. Rewsclear Polytechnic Inst. Troy, NY August 1966. 21 p. 21800

SCHRAMM, W. and NELSON, L. Communication satellites for educational and development. The case of India - volume II, 4 abstracts. Stanford University, Calif., Institute for Communication Research, August, 1968, 274 p. 22700 42700 42760 42700

SCHRAMM, W. Big media, little media 10000

SCHRAMM, W. Salvador. Instructional television in the educational reform in El Information Center on Instructional technology 41700 61700

SHOEMAKER, W. A. Systems models and programs for higher education Council for the advancement of small colleges, April 1973. Academy for Educational Development.

STAFFORD, E. H. and MASSENGILL, P. The relative effectiveness of 5 institutional strategies. Stanford Massengill Corporation, June 1974. 12 p. 62000

STAHL, R. (ed) et al A direct broadcast satellite for education and development in Africa? Stanford University, Calif., Institute for Communication Research, Feb. 1972. 170 p. 22700

= STEVENSON, W. G. Costs of educational media systems - A series II occasional paper from ERIC at Stanford

SPRAGLE, R. E. Cost benefits: a buyers guide for instructional technology. Academy for Educational Development Inc., Washington DC, 1970. 31 p. 10000

US OFFICE OF EDUCATION Papers presented at a Symposium on improving productivity of school systems through educational technology, August 20/22, 1975.

SCANLON, R. G. from individually prescribed instruction to advanced instruction delivery systems

SISSON, R. L. on making decisions about technology in elementary and secondary schools 10000

USSR

KRITCHEVSKY, M. I. and IVANOV, A. V. "Sravnitelnyi tekhniko-ekonomicheskyi analiz proizvodstva kino-itelefilmov na kirostoudiakj" Analyse technico-économique comparative dela production dans les studios de cinéma des films cinématographiques et des films TV. traduction ORTF - Mme. T. Delalot. Extrait de "Tekhnikakino i televidenia" No. 6. juin 1973 22470

EUROPEAN BROADCASTING UNION/UNION EUROPEENNE DE RADIODIFFUSION
Actes du Troisième Congrès International. Paris 8/22 mars, 1967.
Rapports de la Commission II 10000

INTERNATIONAL INSTITUTE FOR EDUCATIONAL PLANNING.

COMBS, P. and HALLAK, J. Educational cost analysis in action: case studies for planners I - 72 - 356 p.
II - 279 p.
III - 72 - 343 p.

TRABENSKI, M. K. Aspects économiques de certaines technologies modernes d'enseignement. December 1971. 86 p. 11000

SCHRAMM W. COOMBS, P. KAHNERT, F. LYLE, J.

New educational media in action: case studies for planners
I - 1967: II - 1967: III - 1967. 42700

TRAPELSKI, M. K. Les coûts de la radio éducative du Sénégal"
1972. 27 p. 41600

The New media: memo to ducational planners, 1967 10000

UNESCO

Compendium on educational policies and practices.
Unesco - ducational Financing Division, December 1968.
Chap III - educational finance
Chap VIII - section X - economic considerations 10000

Document O - Part I - TORRES, J.
Organisation, parameters and costs of distribution and maintenance
of equipment. September 1971 20700

Document T - SALVATORI G.
Technical memoranda on CATV
films 22700
videotape recorders
TV channeling problems
site selection of broadcasting 52400

SMITH, J. et IZARDI, K. A cost effectiveness report on the work-oriented
adult literacy project Iran" A report written in Iran between September
24 and December 12 1971. limited distribution, Unesco ED/WS/281 Paris
January 1972, 40 p. 10000

ANNEX I.3.

LIST OF STUDIES REGISTERED SELECTED AND NOT YET ABSTRACTED/ LISTE DES ÉTUDES RECENSÉES, RETENUES MAIS POUR LESQUELLES IL N'EXISTE PAS ENCORE DE RÉSUMÉS ANALYTIQUES

CANADA

ALLEN, J.N. Report on a study of developments in instructional technology and their application to education for management accountants.
Society for industrial accountants of Canada, Hamilton (Ontario) - Nov. 71 - pp. 83

GILLETTIS Maris M. The costs of information retrieval television - A case study in the cost-effectiveness of educational media - p. 87
The Ontario Institute for Studies in Education

FRANCE

BITRAN, J. Evaluation des techniques modernes d'éducation
Doctorat - en cours

USA

BERGMANN, Brian A.; SIEGEL, Arthur I. Training evaluation and student achievement measurement : a review of the literature.
Applied psychological services, Inc. Wayne, Pa. Jan. 72 - 67 p.

BUCHET, Philip L. Television in rural areas : a low cost alternative
May 1971 - p. 13

BOWEN, Howard R. and Gordon K. Douglass Efficiency in liberal education: a study of comparative instructional costs for different ways of organizing teaching-learning in a liberal arts college.
McGraw Hill Book Company - New York 1971

EGERT Rudy Three models for home-based instructional systems using television.
Rand Santa Monica - October 1972 - 58 p.

EGAN, T.M. Administering Educational Media
McGraw Hill Publishers, 1965

BUTMANN, R.C. Satellite TV for India : Techno-economic factors
Cambridge - Massachusetts Institute of Technology - 1972

CALTNGAERT, Peter Teacher control in computer assisted instruction
Ap. 72 - 23 p.

CARNEGIE COMMISSION on HIGHER EDUCATION: The fourth Revolution - Instructional technology in higher education,
A report and recommendations by the Carnegie Commission - June 1972

DEIGHTON, Lee C. Instruments of instruction : the book plus the media
Academy for educational development, Inc. Washington D.C. - 1970 - 9 p.

DHUMN, B.D. Economics of satellite television for India
Ph.D. Dissertation, Department of economics, Washington University,
Report No. WT 72/1 - May 1972 - 183 p.

DICK Walter An overview of computer-assisted instruction for adult educators.
Florida State University - Tallahasse - CAI Center - 1 Oct. 69 - 27 p.

DIETRICH, J.E. and JOHNSON, F.C. Cost analysis of instruction technology
Academy for Educational Development - 1970 - 19 p.

DLUBATCH, S. A Low cost communication satellite educational system.
System Development Corp. Santa Monica, California - 15 August 1966

DORSETT, Loyd, G. Audiovisual teaching machines
Dorsett Educational Systems, Inc., Norman, Okla. 1970 - 136 p.

DEMOLIN, J.R. and R.P. MORGAN An instructional satellite system for the United States: Preliminary considerations. Memorandum IM-71/2 - July 1971 - 36 p.

EDUCATION TURNKEY SYSTEMS The cost ID model : a new economic tool for the school administrator.
Washington DC. Education Turnkey systems (1600 L Street, NW Washington) 1971 mimeographed

FENICHEL, Robert R. and others A program to teach programming
Massachusetts Institute of Technology - Cambridge - Oct. 69 - 6p.

GENERAL LEARNING CORPORATION Cost study of educational media systems and their equipment components
Washington DC - May 1968 - 18 p.

GERBEL, Glen E. Computer assisted instruction of College Physics students in small groups. Final Report.
National Center for Educational Research and Development - Washington DC - Aug. 72 - 49 p.

GODFREY, Eleanor P. The state of audiovisual technology 1961/66
Association forEducational Communications and Technology - 217 p.

GOLDMAN, Thomas (Ed) Cost effectiveness analysis : new approaches in decisions making.
Washington Operations Research Council, Frederick A. Praeger, Publisher, New York. 1967 - 231 p.

HANSEN, Duncan, N. ; JOHNSON Barbara Measurements techniques for indivisualized instruction in CAI
Florida State University - Tallahasse - CAI Center - 15 nov. 71 - 28 p.

HOUSTON INDEPENDANT SCHOOL DISTRICT - Research Services
A summary of the major findings in the first year of Title I experimental reading programmes : a continuing evaluation - 1971/72

HOWEY, Mary Lou Production Cost Analysis
Educational Television - Nov. 70

ILLINOIS Telecommunications Commission, Hinsdale : System Development Corp. Santa Monica
"Telecommunications study for the state of Illinois, Report I - final report - 15 Fev. 69 - 356 p.

INSTITUTE FOR COMMUNICATION RESEARCH-STANFORD UNIVERSITY
HORTIK Robert C. - INGLE Henry T. - MAYO John K. - McANANY Emile G; SCHRAMM W.
Television and Educational Reform in El Salvador
Aug. 73.

JAMISON, Dean and others Satellite systems for instructional radio
Rand Corp. Santa Monica, Calif. Aug. 68 - 13 p.

JAMISON, Dean - BALL John
Computer assisted instruction for dispersed populations : system cost models, technical report number 190
Stanford University - Calif. Inst. for Mathematical studies in social science
15 sep. 72 - 58 p.

JAMISON, Dean; KIFFS Steven The cost of instructional radio and television for developing countries
Stanford University - Institute for Communication Research Mar. 73 - 103 p.

JAMISON, Dean Notes on cost effectiveness evaluation of schooling in developing countries
Stanford University - Institute for Communication Research

JOHNSON, Leland Cable television and higher education : two contrasting experiences
Rand corporation, Santa Monica, Calif. - Sep. 71 - 53 p.

JONES, Gardner and others Unit costs provide basis for meaningful evaluation of efficiency of TV Courses Apr. 69 - 4p.

KIESLING, Herbert On the economic analysis of educational technology
To improve learning - an evaluation of instructional technology -
New York : R.R. Bowker Co. 1971

LIPPERT, Henry I - MORRIS, Edward V. APL: an alternative to the multi-language environment for education. Systems research
Memo number 4.
Florida State University - Tallahasse - CAI Center - 15 Aug. 70 - 23 p.

MOLNAR, Andrew R. Educational technology, the white elephant
Office of Education (DHEW) Washington, Bureau of Research - 11 Mar. 69 - 20 p.

MILLER, James G. Deciding whether and how to use educational technology in the light of cost-effectiveness evaluation
Academy for educational development - 70 - 49 p.

MILLER, James G. and Rath, Gustave J. Planning-programming-budgeting and cost-effectiveness analysis in educational systems. To Improve learning - Vol. II - R.B. Bowker Company, New York - 1971 - pp. 1030 - 1059

MITZEL Harold, and others A Commonwealth Consortium to develop, implement and evaluate a pilot program of computer-assisted instruction for urban high school - Final Report.
Pittsburg University, Pa. School of Education - Jul. 71 - 213 p.

MOINAR, Andrew R. Media and cost effectiveness
ACES Analog Hybrid Computor Educational Society, West Long Branch - N.Y. Oct. 70 - 8 p.

MORGAN, Robert M. A review of educational applications of the computors including those in instruction, administration and guidance. A series two paper from ERIC at Stanford. Aug. 69. 13 p.

MORGAN, R.P., ROBINSON B., ROTHENBERG J. and J.P. SINGH Opportunities for large scale telecommunications systems using communications satellites
Memorandum 73/6 - (forthcoming)

MORGAN, R.P. and J.P. SINGH Communication satellites in Education
in Handbook on contemporary Education - R.R. Bowker Company (forthcoming)

MORGAN, R.P. and J.P. SINGH A guide to the literature on application of communications satellites to educational development
Series one paper, the ERCI Clearinghouse on educational media and technology, Stanford, April 1972, NASA.

MORGAN, R.P. and J.P. SINGH Satellites for US Education: needs, opportunities and systems
AIAA Paper No. 72-523, Fourth AIAA Communications Satellite System Conference, Washington April 21/26, 1972
Communication Satellites : systems and Advances concepts, MIT Press, Cambridge, 1973

NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS, Washington DC
"Report of the Board Committee on Long Range Planning"
1970 - 19 p.

NIEMAUS, C.A. Utilization of telecommunications by Academic and School libraries in the U.S.
Memorandum 72/1 (51 p.), March 1972

NIEMI, John A., Ed. Mass media and adult education
1971 - 124 p.

OETESCH, Gabriel D.
Dial access information retrieval systems : guidelines handbook for educators - Final report - Catholic University of America, Washington - July 68 - 177 p.

ORLICH, Donald, C., Ed.; MILLEN Charles O., Ed. Telecommunications for learning
General telephone Co of the NorthWest, Everette Washington
Washington State University - Feb. 69 - 59 p.

POLCYN, Kenneth A. An educator's guide to communication satellite technology
Information Center on instructional technology - September 1973

SCHRAMM, Wilbur
ITV in American Samoa - after nine years

SCHELKES de SOTOLO Sylvia The radio schools of the Tarahumara, Mexico: an evaluation
Institute for Communication Research, Stanford University

SINGH, Jai P. ; MORGAN, Robert P. Computer-based instruction : a background paper on its status, cost-effectiveness and telecommunications requirements.
Washington university - St. Louis, Ma. April 71, 40 p.

SINGH Jai P. Educational computer utilization and computer communications
Washington University, St. Louis, Mo - Nov. 71 - 101 p.

SINGH, J.P., MORGAN, R.P. and F.J. ROSENBAUM Satellite networks for education -
Proceedings of international telemetering Conference,
Los Angeles, Calif. October 10.12 - 1972 - p. 419/439

TICKTON, Sidney G. ; KOHN, Sherwood Davidson The nwe instructional technologies : are they worth it?
Academy for educational development, Inc. Washington D.C. - Sep. 71 - 110 p.

TICKTON, Sidney G. Ed. To improve learning : an evaluation of instructional technology - Volume II - Part 3. Instructional technology - Theories and general applications. Part 4 Instructional technology - Practical considerations - Part 5: instructional technology ; implications for business and industry - Part 6 : instructional technology : economic evaluations.
Academy for educational development. Inc. Washington DC April 71 - 1095 p.

U.S. DEPARTMENT OF HEALTH, EDUCATION and WELFARE - BUREAU OF RESEARCH
Implementation of research strategies and tactics for demonstrations of newer media - final report September 1966

LISTE DES ETUDES SIGNALEES AU CIME DEPUIS L'INVENTAIRE SYSTEMATIQUE DE FIN 1973/ LIST OF STUDIES BROUGHT TO THE ATTENTION OF ICEM SINCE THE INVENTORY MADE AT THE END OF 1973

Cette liste, très provisoire, devra être complétée, entre autres, par les destinataires du présent document. This provisional list should be completed, amongst others, by those receiving this document.

FEDERAL REPUBLIC OF GERMANY (République fédérale d'Allemagne)

BENSEGGER, R. "Zum Thema Finanzierung" in Visodata 73 - Mediensysteme im Bildungswesen - Dokumentation. Munchen, 1974. pp. 293 -300.

EDDING, F. "Bemerkungen zum Theme Medienmarkt und Finanzierung" in Visodata 73 - Mediensysteme im Bildungswesen - Dokumentation. Munchen, 1974. pp 315 - 318.

GAUSS, W. "Finanzierungsprobleme der Buldungstechnologie aus der Sicht der Elektronik-Industrie" in Visodata 73 - Mediensysteme im Bildungswesen - Dokumentation. Munchen, 1974. pp 301-306.

SCHIRM, R. W. "Uber die Entwicklung der Kosten für die Software audio-visueller Systeme" in Visodata 73 - Mediensysteme im Bildungswesen - Dokumentation. Munchen 1974. pp. 306-315.

FRANCE (France)

B E T E A - No. 1/74. "Etude technico-économique comparée des media utilisés dans le télé-enseignement". Paris, 1974. 56p.

B E T E A - No. 2/74. "Etude du prix de revient d'une mini-cassette et d'une bande magnétique standard concernant le télé-enseignement en fonction des différents paramètes". Paris, 1974. 34p.

B E T E A - No. 7/74. "Etude technique et économique d'une unité de production couleur - studio fixe pouvant servir d'école d'essai de production en vue du passage sur antenne - équipement mobile". Paris, 1974. 42p.

B E T E A - No. 10/74. "Les appareils de projection transportables les mieux adaptés à l'utilisation des techniques de groupe". Paris, 1974. 31 p.

UNITED KINGDOM (Royaume Uni)

LAIDLOW, B. and LAYARD, R. Traditional versus Open University Teaching Methods: a cost comparison. 1974. 46 p.

U S A

ALBERT, J. G. Wanted: experiments in reducing the cost of education. Phi, Delta Kappa, New York. March 1974.

BLISS, S. W. et al. "Cost Analysis of the implementation of career education instructional packages" - Final report. Northern Arizona University, Educational Resources Management Center. 19 July 1973. 71 p.

EVANS, A. "Costing a videocassette learning system - some ideal data" in Audiovisual Instruction, January 1975. pp 27-29.

FLYNN, D. et al. The resource approach to program cost analysis. February 1974. 34 p.

HARRIS, G. E. O'FALLON and O'KENNETH. Cost analysis of secondary school vocational technical education programs. Tennesee Research Coordinating Unit for Vocational Education. Tennesee University, Knoxville. Bureau of Educational Research and Service, June 1973. 114 p.

JAMISON, D. "Notes on cost-effectiveness evaluation of schooling in developing countries". Stanford University, Institute for Communication Research, 1973. 61 p.

KIDLAID, H. et al. Technology in public elementary and secondary education - a policy analysis perspective. Stanford Research Institute, Menlo Park, California Policy Research Center. April 1974. 181 p.

MOLDSTAD, J. A. "Selective review of research studies showing media effectiveness: a primer for media directors" in Audiovisual Communication Review, 1974. Vol 22 No. 4. pp. 387-407.

PEARSON R. M. Cost effectiveness analysis: the selection of a decision assisting tool for instructional development. Instructional Science Associates, Madison Wis., 1973. 73 p.

SINGH, J. P. and JAMISON, D. "The satellite instructional television experiment in India: a case history" A report prepared for the Academy for Educational Development, Inc., Washington. (forthcoming).

SINGH, J. P. MORGAN, R. P. WALKMEYER, J. and STAGL, W. T. "Satellites for US education: technology, markets, economics, alternative systems and implication" Memorandum No. 73/7 (forthcoming)

WICKLISON, G. L. "Needed: information for cost analysis" in Instructional Technology, July 1972.

WINKLER, S. (ed). Applications of learning technology: progress and problems. The second Symposium on cost effective learning through the application of computer technology. February 21/22, 1973. Washington National Security Industrial Assoc., M. Dept. ACT, Suite 700. 750, 15th St. NW Washington DC 20005.

ANNEX III

LISTE PROVISOIRE DES INSTITUTIONS ET EXPERTS

PROVISIONAL LIST OF INSTITUTIONS AND EXPERTS

Country/pays	organisation	expert
CANADA	Ontario Institute for Studies in Education. 252 Bloor Street West. TORONTO, Ontario, M5S IV6	
		Dr. Stuart Wells, Faculty of Commerce, University of British Colombia, VANCOUVER.
FRANCE	Bureau d'Etudes Technico-Economiques appliquées à l'Enseignement Audiovisuel, Voie des Pilotes, 94 BRY sur MARNE	
		M. le Professeur DEBEAUVAIS, Université de Paris VIII.
	Institut de l'Audiovisuel, Voie des Pilots - 94 BRY sur MARNE	
	Institut de Recherche sur l'Economie de l'Education (IREDU) - Campus Universitaire, Faculté Mirande, 21000 DIJON.	M. le Professeur Eicher, Directeur M. ORIVEL
	Office Française des Techniques Modernes d'Education, Département Recherche et Formation, 29 rue d'Ulm, 75230 PARIS CEDEX 05	

GERMANY. FEDERAL REPUBLIC	Deutsches Institut für Fernstudien an der Universität Tübingen (DIFF), Wordstrasse, 8. TÜBINGEN	Walter SCHNEIDER Hermann SIGELEN
	Max Plank Institut für Bildungsforschung, LenzenAllee, 94. Lo1000 BERLIN 33	J, NAUMANN
	Staatsinstituts für Bildungsforschung und Bildungsplanning, Arabellastrasse, 1, 8000 MUNCHEN 81,	Prof. SHORB, Director
INDIA		Dr. S. K. MITRA, Joint Director, NCERT, Delhi 16.
	Institue of Economic Growth, NEW DELHI	Dr. B. D. DHAWSAN
	Space Applications Centre, Jodhpur Tekra, Ahmedabad, 380009	Prof. Yash PAL
	Indian Space Research Organisation BANGALORE, 9.	Prof. J. P. SINGH
INDONESIA	Bandung Institute of Technology, Bandung	Dr. Iskander ALISJABANA
JAPAN	NHK Research Institute, Atogoyama, Minato-ku, TOKYO	Mr. GOTO
MEXICO		Mr. Eduardo ARENA, La Presidencia, Mexico D.F.
	Centro Latino Americano de la Technologia Educative por la Salud, MEXICO City	Dr. J. Alvarex MANILLA, Director

POLAND	Université de GDANSK	Prof. Kasimir PODOSKI
	In titut de Recherches Pédagogiques, Groupe Economie de l'Education	Prof. KOWALSKI
UNITED KINGDOM	Educational Technology Centre, University of Sussex, Falmer, Brighton. Sussex.	
	University of Technology, BATH.	
	Institute of Educational Technology, Open University, Milton Keynes	M. Leslie WAGNER
	London School of Economics, Higher Education Research Unit, London	LAYARD, Richard, Director of the Unit.
		M. J. OATEY, South Bank Polytechnic School 10 Colville Gardens, London W.11.
U S A		Dr. C. Block, Technical Assistance Bureau US Agency for International Developments, Dept. of States, WASHINGTON
	Centre for Development Technology, Box 1106, ashington University, St. Louis, MO 63130	Prof. Lester F. EASTWOOD Prof. Harold J. BARNETT
		JAMISON, Marchall, Dr. 2141 Hilltop Place, Falls Church Virginia.
		D. JAMISON, Education Testing Services, University of Princeton, New Jersey
	Joint Council on Educational Telecommunications 16th Street, NW, Washington D.C.	Mr. F. NORWOOD,

U S A		Mr. Gordon LAW Project Director, Ed. Technology Demonstration Project. Federation of Rocky Mountain States, DENVER, Colorado
	National Institute of Education, Dept., of Health, Education and Welfare (DHEW) WASHINGTON D C	Mr. Arthur MELMED
		Dr. S. KLEES, Department of Education, Cornell University ITHACA, NY
	Stanford University, Institute for Communication Research	J. R. MAYO, E. G. McANANY, M. CARNOY, H. LEVIN
	School of Education	
	Office of Educational Technology Programmes, National Science Foundation, Washington DC	Mr. E. McWILLIAMS
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